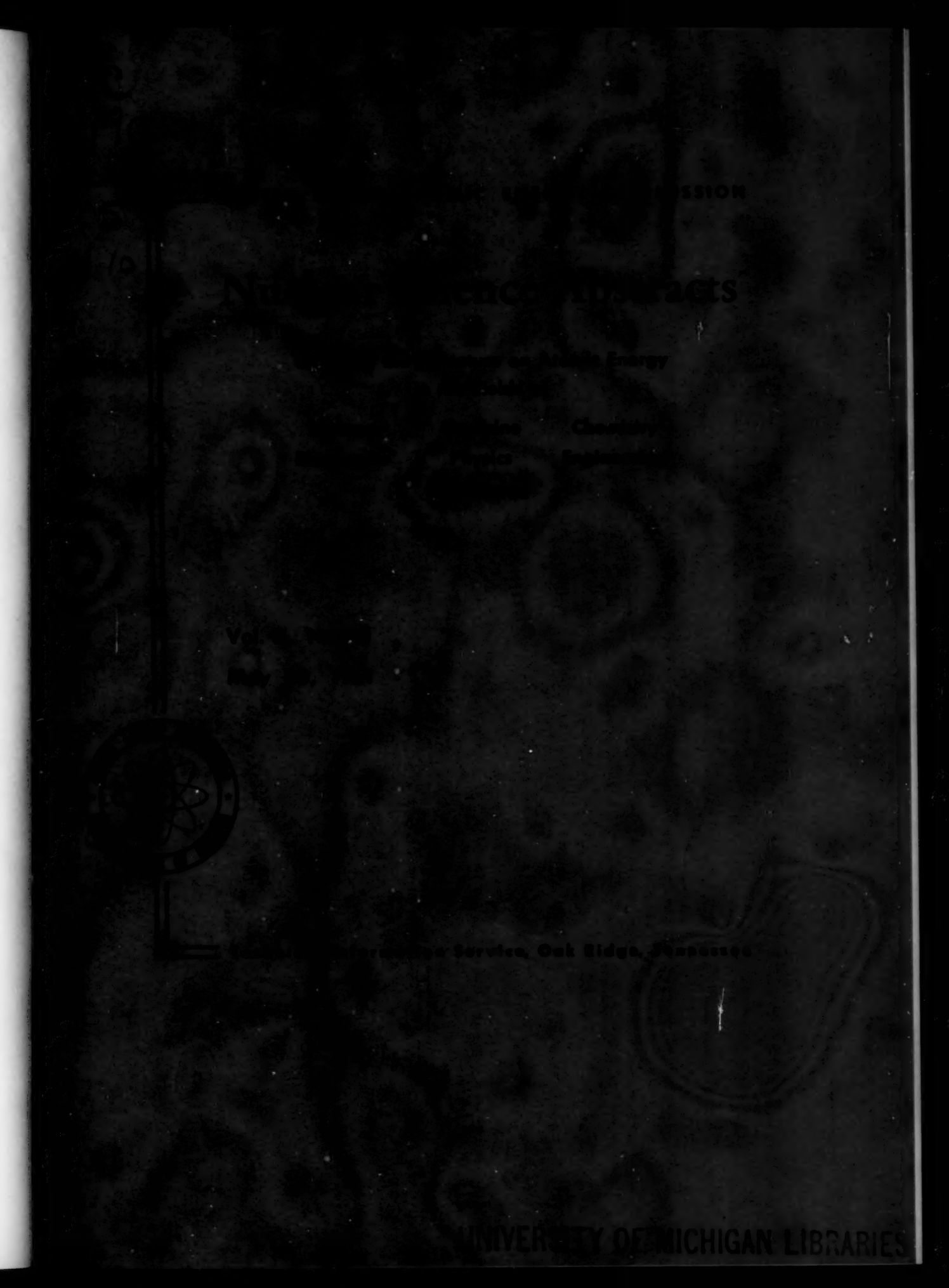

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Report	Title, Author	Abstract
NEPA-1451	An Investigation of Electromagnetic Flowmeters; Technical Report I. N. G. Elrod, Jr., and R. R. Fouse.	2506
NP-1678	The Production of a Charged Meson by a Nucleon; Technical Report No. IV; Synchrotron Project. Ellis Strick.	2559
NP-1725	Quarterly Progress Report on Alloys for High Temperature Service to Office of Naval Research. E. E. Fletcher, A. R. Elsea, A. B. Westerman, and G. K. Manning.	2476
NP-1733	Research on Crystal Detectors of Ionizing Radiation; Final Progress Report; 1 June 1949 - 31 August 1950. Princeton University.	2550
NP-1852	Calculations Relative to the Thermal Entry Length for Fluids of Low Prandtl Number. R. A. Seban and T. Shimazaki.	2456
NP-1855	National Bureau of Standards Report of the Office of Basic Instrumentation for the Quarter Ending September 30, 1950. W. A. Wilkhack.	2507
NP-1863	[Technical Reports 1 through 4.] Walter M. Nielson.	2491
NP-1863(T.R.1)	Cosmic Ray Bursts in Ionization Chambers of Different Materials; Technical Report No. 1 of [Technical Reports 1 through 4]. Harold W. Lewis.	2493
NP-1863(T.R.2)	A Cloud Ionization Chamber for the Study of Cosmic Ray Nuclear Interactions; Technical Report No. 2 of [Technical Reports 1 through 4]. H. W. Lewis, W. W. Brown, D. O. Seevers, and E. W. Hones.	2494
NP-1863(T.R.3)	Gamma Ray Spectrum of K^{40}; Technical Report No. 3 of [Technical Reports 1 through 4]. Myron L. Good.	2495
NP-1863(T.R.4)	Positron Search in K^{40}; Technical Report No. 4 of [Technical Reports 1 through 4]. Myron L. Good.	2496
NP-1920	Rochester High Energy Physics Program; Final Report; July 1, 1949, to August 31, 1950. Rochester University.	2490
NP-1939	Report on Rapid, Colorimetric Method for Uranium Analysis to be Used in Plant Control Work. Grace Brackenbury.	2417
NP-1940	A Circular Slide Rule for High-Pressure Ionization Chamber Calculations. P. Normand.	2540
NP-1945	Discriminator Design and Construction for the Carnegie Institute of Technology Synchro-Cyclotron; Synchro-Cyclotron Technical Report No. 7. Charles H. Grace.	2592
NP-1946	A Preliminary Investigation of the Analogy of the Transfer of Vorticity to the Transfer of Heat in Fluids of Low Prandtl Number. R. G. Kennison, Jr.	2457
NP-1949	Periodic Status Report No. 24; Fundamental Properties of Metal-Ceramic Mixtures at High Temperatures; Progress during Period December 1, 1950, to January 31, 1951. W. B. Crandall and W. G. Lawrence.	2463
NP-1953	Zirconium Process Development; Consolidated Report No. 1; 15 June - 15 November 1950. W. W. Stephens.	2478
NP-1966	A Survey Experiment on Elastic Scattering; Technical Report No. 6. Jack W. Burkig and Byron T. Wright.	2605
NP-2178	The Formation of Electron Pairs in Radioactive Decay; trans. from Zhur. Eksptl'. i Teoret. Fiz. 7, 696-713(1937). V. B. Tissa; tr. by C. Feldman.	2620

REPORTS REFERENCE LIST

Report	Title, Author	Abstract
NP-2242	Ionic Migration in a Counter-Current as a Basis for Electrochemical Exchange Process; trans. from Z. Naturforsch. 4a, 28-37(1949) Apr. Hans Martin.	2517
NP-2244	The Method of Molecular Spectra and the Fractionating of the Rare Earths; trans. from Spectrochim. Acta 1, 249-69(1939). G. Piccardi; tr. by Joe G. Raeber.	2438
NP-2259	On the Rational Representation of the Periodic System of the Elements; trans. from Zhur. Obshchel. Khim. 19, No. 6 (1949). A. E. Shtandyel.	2432
NRL-3693	Electron Microscopy of Metal Samples by Replica Techniques. L. S. Birks and R. T. Seal.	2474
NRL-3723	Organic Scintillators. S. H. Liebson.	2548
ORNL-87-50	Unclassified Research at the Atomic Energy Research Establishment, Harwell. Thomas Coor.	2306
ORNL-100-50	Research at the Institute for Nuclear and Molecular Physics at the University of Louvain. G. F. Hull, Jr.	2305

GENERAL

ATOMIC BOMBS AND WARFARE

2302

COMMENTS ON THE MILITARY VALUE OF THE ATOM. J. Robert Oppenheimer. Bull. Atomic Scientists 7, 43-5 (1951) Feb.

The question is raised: what contribution can the atom (atomic energy release) make to our military power, the power for the prevention of war, the limitation of war, and to the defeat of the enemy in case of war? Technical questions of policy, strategic bombing, and tactical uses are discussed. Three ways are indicated in which the atom may serve as military power: (1) destruction of plant life and people, (2) destruction of military targets, and (3) as a deterrent to war.

ATOMIC POWER

2303

NUCLEAR POWER ISN'T CHEAP—YET. C. G. Suits. Chem. Eng. 58, 3, 246(1951) Mar.

Figures are presented by which it is shown that two out of three hypothetical nuclear reactors can not compete with coal as a heat source for power. The third case presupposes an efficient breeding cycle for nuclear fuel and high transportation costs for coal.

RESEARCH PROGRAMS

2304

INDUSTRIAL AND SAFETY PROBLEMS OF NUCLEAR TECHNOLOGY. Morris H. Shamos and Sidney G. Roth, ed. New York, Harper & Brothers, 1950. 368p.

A discussion is given of the Atomic Energy Commission and its activities, radiochemistry and isotopes, the radiochemical laboratory, and hazards, safety, and insurance.

2305

Office of Naval Research, London
RESEARCH AT THE INSTITUTE FOR NUCLEAR AND MOLECULAR PHYSICS AT THE UNIVERSITY OF LOUVAIN. G. F. Hull, Jr. Sept. 11, 1950. 4p. (ONRL-100-50)

At the University of Louvain, Belgium, a new physical institute has been built for research in nuclear and molecular physics. Research in molecular physics is chiefly in the field of spectroscopy. The molecular spectra under investigation are band spectra in the visible and ultraviolet, Raman, and infrared spectra. Mass-spectroscopic research is also under way for the separation of isotopes. The separated isotopes are used in the spectroscopic research program as well as in the nuclear research program. For the nuclear research, a pressure van de Graaff generator developing about 1 Mev is available. Also, there is under construction a cyclotron which will deliver about 10-Mev protrons. The entire research program is under the direction of Professor M. DeHemptinne. (auth)

2306

Office of Naval Research, London
UNCLASSIFIED RESEARCH AT THE ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL. Thomas Coor. Aug. 21, 1950. 8p. (ONRL-87-50)

The organization of the Atomic Energy Research Establishment, Harwell, England, and the programs of some of the scientific divisions are discussed. The present work is described concerning the velocity analysis of neutrons by the time-of-flight neutron spectrometer method. The status of the 5-Mev van de Graaff generator is described, and some of the problems limiting the voltage which the vacuum tube will withstand to 2 Mev are discussed. Alkali halide scintillation counter research, using Tl as an activator, applied to neutron, α-ray-particle, and proton counting, is described briefly. It has been found that application of a magnetic field to a proportional counter increases the resolution of monoenergetic γ-ray lines. (auth)

BIOLOGY AND MEDICINE

2307

Argonne National Lab.
QUARTERLY REPORT, MAY, JUNE, JULY, 1950; DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH. Austin M. Brues, Director. July 1950. 149p. (ANL-4488)

Separate abstracts have been prepared on the following sections of this report: Progress Report: The Excretion of Sr^{89} by Goats, p.11-20; Preliminary Report: Nembutal Dosages for Experimental Animals, p.21-4; Effect of Radiophosphorus on Rats with Cobalt-induced Polycythemia (abstract), p.25-6; Preliminary Report: Further Studies of the Protective Effects of Shielding, p.27; Electron Microscope Study of the Microscopic Network of Fibrils as a Component of Connective Tissue (abstract), p.28-37; On the Nature of Cysteine-induced Radioresistance: Sulfhydryl Levels and Distribution of Cysteine Sulfur (abstract), p.38; Preliminary Report: The Effect of Acute Adrenal Insufficiency upon the Rate of Absorption and the Distribution of Phosphorus in the Rat, p.39-44; Preliminary Report: Effects of High Oxygen Concentrations upon the Growth of a Transplantable Mouse Carcinoma, p.45-51; Progress Report: Renal Function in the Chicken Following X Irradiation, p.52-3; A Phase Contrast Microscopy Study of X-ray-induced Pycnosis in the Living Cell (abstract), p.54; Progress Report: The Effect of Anoxia on X-ray-induced Injury in Melanoplus differentialis Embryos, p.55-8; Progress Report: Animal Quarters, p.59-64; Progress Report: Chemical Dosimetry, p.65-7; Colorimetric Estimation of Indoleacetic Acid (abstract), p.68; A Modified Digestion-Distillation Apparatus for Wet Carbon Procedures (abstract), p.69-73; Preliminary Report: Autoagglutination in Paramecium bursaria Following Exposure to Ultraviolet and to X Radiation, p.74-7; Progress Report: Studies on the Mechanism of Action of Irradiated Water on Cell Metabolism, p.78-81; Progress Report: Radiochemistry, p.82-4; Progress Report: Preparation of Detailed Radioautographs of Bone, p.85-6; Rate of Citric Acid Accumulation in Tissues Induced by Fluoroacetate Administration, p.87-9; Preliminary Report: ACTH and Experimental Beryllium Poisoning, p.90-1; The Absence of Inhibition of −SH Enzymes by Moderate Amounts of X Radiation (abstract), p.92; Preliminary Report: The Effect of X Irradiation on Fighting Behavior in Male Mice, p.93-104; Preliminary Report: A Comparative Study of Radiation Lethality in Several Species of Experimental Animals Irradiated for the Duration-of-Life, p.105-22; Progress Report: Background Analytical Group, p.123-34; Progress Report: Radiological Physics Research, p.135-41; and Progress Report: Air Contaminants, p.142.

2308

Argonne National Lab.
PRELIMINARY REPORT; NEMBUTAL DOSAGES FOR EXPERIMENTAL ANIMALS; p.21-4 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. E. L. Simmons and Edna K. Marks. July 1950. 4p. (ANL-4488(p.21-4))

Recommended Nembutal anesthesia dosages are listed for rats of 140 to 260 g, for mice of 10 to 30 g, and for guinea pigs of 200 to 900 g in weight.

2309

Argonne National Lab.
ELECTRON MICROSCOPE STUDY OF THE MICROSCOPIC NETWORK OF FIBRILS AS A COMPONENT OF CONNECTIVE TISSUE (abstract); p.28-37 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. F. Wassermann. July 1950. 10p. (ANL-4488(p.28-37))

A network of fibrils in the ground substance was studied with improved technique. Electron micrographs were obtained in which the contrasts are much greater than those in an earlier paper (ANL-4401). The fibrils show the typical periodic structure of collagen and can be measured. It was found that the solitary fibrils have diameters of about 500 A. The demonstration of the collagen fibril is nothing new. However, the technique of preparing connective tissue spreads makes it possible to show a network of these fibrils as solitary structures in the connective tissue of adult animals (mice). Although these are present regularly in the tissue of animals of different age groups, it may be that the fibrils are particularly abundant in young animals and in pregnant females. Should this be true, it would not contradict the statement that the network of submicroscopic fibrils is a regular constituent of connective tissue. 3 figures.

2310

Argonne National Lab.
PRELIMINARY REPORT; EFFECTS OF HIGH OXYGEN CONCENTRATIONS UPON THE GROWTH OF A TRANSPLANTABLE MOUSE CARCINOMA; p.45-51 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. B. V. Hall and R. D. Boche. July 1950. 7p. (ANL-4488(p.45-51))

Experimental results are interpreted to mean that the slight evidence for inhibition of the growth of transplanted carcinomas in animals kept for 82 and 92 hr in 100 and 87% O_2 is due to the resulting general debility of the host animal rather than to any direct effect of the increased oxygen tension upon the growth of the tumor. It is agreed that variations in the partial pressure of O_2, by themselves, are of no value in limiting the growth of tumors.

2311

Argonne National Lab.
PROGRESS REPORT; ANIMAL QUARTERS; p.59-64 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. R. J. Flynn. July 1950. 5p. (ANL-4488(p.59-64))

Description of portable apparatus for filling water containers on cage racks, a steam cleaner, and a mouse cage in the animal quarters are presented. Transplantable neoplasms maintained in the animal quarters are listed.

2312

Brookhaven National Lab.
BIOLOGY DEPARTMENT; p.111-20 of QUARTERLY PROGRESS REPORT; JULY 1 - SEPTEMBER 30, 1950. Nov. 1950. 10p. (BNL-82(p.111-20))

Work is continuing in an effort to establish a method for the measurement of nucleic acids in fixed sections of cells. A series of experiments has been undertaken on extracts from the cells of Lilium longiflorum. The extracts were analyzed by conventional methods for the determination of nucleic acids and also by the ultraviolet absorption method developed at the laboratory. A preliminary analysis of the data indicates that there is little quantitative agreement between the different methods. Action of x rays on enzymes, radiation, effects in mammals, and effects of radiation on seeds, bacteria and corn are indicated. Tracer studies of biological problems including the mechanism of glycosis, the fate of ingested and injected ascorbic acid, separation of labeled amino acids, etc., are presented.

2313

Brookhaven National Lab.
MEDICAL DEPARTMENT; p.121-2 of QUARTERLY PROGRESS REPORT; JULY 1 - SEPTEMBER 30, 1950. Nov. 1950. 2p. (BNL-82(p.121-2))

During the report period, treatment of patients with thyroid carcinoma has continued. I^{131} has been used throughout. Patients with hyperthyroidism have also been treated with I^{131}. Reference is made to problems involving body protein metabolism during and following injury and in other abnormal states. Studies are being carried out on the metabolism of C^{14}-labeled compounds in mice. Methods have been developed in the laboratory to determine antipyrine and sucrose in body fluids, to measure red-cell mass in vivo with P^{32}-labeled red cells.

2314

Atomic Energy Project, Univ. of California, Los Angeles
THE EFFECT OF TOPICALLY APPLIED ADRENERGIC BLOCKING AGENTS UPON THE PERIPHERAL VASCULAR SYSTEM. Thomas J. Haley and Margaret Andem. Dec. 15, 1950. 10p. (UCLA-101)

The peripheral vascular effects of 11 adrenergic blocking agents have been investigated on the rat mesoappendix preparation. Vasoconstrictor, adrenergic blocking, and antihistaminic actions have been observed after direct application of these drugs to the capillary bed. It has been demonstrated that the site of these actions is the precapillary sphincters and the terminal arterioles. (auth)

2315

Atomic Energy Project, Rochester Univ.
QUARTERLY TECHNICAL REPORT; JULY 1, 1950, THRU SEPTEMBER 30, 1950. Henry A. Blair, Director. Nov. 1, 1950. 135p. (UR-142)

Separate abstracts have been prepared on the following sections of this report: The Role of the Carbon Skeleton of Lysine in the Biosynthesis of Hemoglobin, p.13-15; The Degenerative Changes in the Testes of the Adult Rat after X-Irradiation, p.16-28; The Metabolism of Polyphosphates in Reference to the Treatment of Metal Poisoning, p.29-40; Organ Weights and the Calculation of Transport of Insoluble Particles from the Lung, p.41-51; Antidotal Action of Polyphosphates in Uranium Poisoning, p.52-5; BeF_2 Mist Inhalation Study in Animals at 2 mg/m³, p.56-71; Inhalation Toxicity of Thorium Oxalate, p.72-5; The Relation of Optical Density to Quantity of UO_2 Deposited on Filter Paper, p.76-8; Studies in Protein Metabolism with a C^{14}-Labeled dl-Lysine, p.79-95; and Fast Neutron Survey of the Small Cyclotron, p.96-125.

2316

Atomic Energy Project, Rochester Univ.
ORGAN WEIGHTS AND THE CALCULATION OF TRANSPORT OF INSOLUBLE PARTICLES FROM THE LUNG; p.41-51 of QUARTERLY TECHNICAL REPORT; JULY 1, 1950, THRU SEPTEMBER 30, 1950. C. W. LaBelle, H. E. Stokinger, and J. M. Dohl. Nov. 1, 1950. 11p. (UR-142 (p.41-51))

A knowledge of the weights of the organs in a normal animal and the probable extent and magnitude of the associated variations is fundamental to an analysis of internal transport mechanisms. The present report is, therefore, presented in two sections; the first deals with normal organs of rats and their variation, and the second section presents a few elementary calculations based on an inhalation exposure showing how the results may be affected in a specific case.

RADIATION EFFECTS

2317

Brookhaven National Lab.
THE SURVIVAL OF RATS ADRENALECTOMIZED AFTER X-IRRADIATION. Abraham Edelmann and Seymour Katsh. 1p. [nd.] (AECU-1137)

This report is reproduced here in its entirety.

Rats were adrenalectomized at various times after a dose of whole-body x irradiation (600 r, 160 kvp, 10 ma, 0.2 mm Cu, a dose which does not kill normal control rats in this laboratory), and the time of death was noted. It was observed that the life span was reduced when the time interval between irradiation and adrenalectomy was decreased. This relation was not linear, a greater effect being noticed at the shorter intervals. If the irradiation was given 5 or more days before the adrenalectomy, the life span of the irradiated-adrenalectomized rats approached that of the unirradiated-adrenalectomized rats. This may be interpreted to mean that the need of the animal for adrenal hormones to survive is most acute immediately after irradiation and rapidly diminishes after 3 to 5 days.

2318

Naval Radiological Defense Lab.
THE EFFECTS OF X-IRRADIATION ON A NATURALLY OCCURRING ENDEMIC INFECTION. (Technical Objective AW-6) V. P. Bond, I. L. Schechmeister, M. N. Swift, and M. C. Fishler. Nov. 29, 1950. 17p. (AD-273(B))

The effects of x irradiation on animals from a laboratory colony in which a pulmonary infection was endemic were studied. The results indicate that irradiation increases the rate of spread of the disease, or "activates" infection that otherwise might remain latent in unirradiated animals, and that the LD_{50} for rats showing gross evidence of a disease that in itself does not kill immediately is reduced considerably below that for apparently normal animals. The necessity of maintaining a healthy experimental animal colony, particularly where investigations may extend over several weeks and involve a debilitating agent such as x ray, is emphasized. (auth)

2319

Argonne National Lab.
EFFECT OF RADIOPHOSPHORUS ON RATS WITH COBALT-INDUCED POLYCYTHEMIA (abstract); p.25-6 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. W. F. Bethard, Ellen Skirmont, and L. O. Jacobson. July 1950. 2p. (ANL-4488 (p.25-6))

No significant difference in sensitivity of the blood-forming tissues to P^{32} exists between normal rats and rats with an established Co-induced polycythemia. In contrast, the initial bone marrow hyperactivity following Co administration apparently affords some protection against the destructive effects of P^{32} when the two are begun simultaneously.

2320

Argonne National Lab.
PRELIMINARY REPORT; FURTHER STUDIES OF THE PROTECTIVE EFFECTS OF SHIELDING; p.27 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. E. L. Simmons. July 1950. 1p. (ANL-4488(p.27))

A brief report states that data from experiments show that a marked increase in survival occurs in both male and female rats when the intestine is surgically mobilized and lead-protected during total-body x irradiation. Initial studies of survival of the x-irradiated, spleen-shielded rat show less positive results than those obtained when mice were irradiated with spleen protection. Preliminary experiments have failed to show any increased capacity of the spleen to aid survival following x irradiation when priming doses of 100, 200, or 300 r were given before 800 r. However, there was an increase in mortality with increase in the total dose administered.

2321

Argonne National Lab.
ON THE NATURE OF CYSTEINE-INDUCED RADIORESISTANCE; SULFHYDRYL LEVELS AND DISTRIBUTION OF CYSTEINE SULFUR (abstract); p.38 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. H. M. Patt, R. L. Straube, Margaret E. Blackford, and D. E. Smith. July 1950. 1p. (ANL-4488(p.38))

Cysteine may increase radioresistance by (1) decreasing free-radical production, (2) competing directly for oxidizing free radicals, (3) shifting the redox potential of critical cell elements, thus protecting them against oxidation, and (4) altering metabolic pathways. Assuming selective action on sulfhydryl groups by products of irradiated water, less than 1% of nonprotein −SH (as cysteine) could theoretically be oxidized when a 200-g rat is exposed to 800 r. X irradiation had no immediate observable effect on −SH levels in control and cysteine-treated rats, although cysteine per se (950 mg/kg intravenous) increased the oxidizable −SH content of TCA filtrates of serum, kidney, thymus, intestine, and liver. Rather identical retention of S^{35} was noted in blood of rats receiving labeled cystine, cysteine, or cysteine followed by x irradiation (60 mg cystine or cysteine, 5×10^5 cpm/intravenous). Uptake of S^{35} by liver and intestine was more rapid in cysteine-injected rats. X radiation appeared to decrease the rate of uptake and retention. The initial concentration of S^{35} in bone marrow was similar in cystine- and cysteine-treated animals but fell sharply during the first hour in the latter. Marrow uptake was decreased by irradiation. No clear relationship between S^{35} concentration in these tissues and the time course of cysteine protection was evident.

2322

Argonne National Lab.
PROGRESS REPORT; RENAL FUNCTION IN THE CHICKEN FOLLOWING X IRRADIATION; p.52-3 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. S. Phyllis Stearner, A. M. Brues, and Emily J. B. Christian. July 1950. 2p. (ANL-4488(p.52-3))

Blood uric acid has been shown to increase rapidly in the chicken following x irradiation (1000 r, 43 r/min), indicating a possible early impairment of renal function. To explore irradiation effects on renal function, phenol red excretion has been measured on newly hatched chicks following this exposure. The results obtained from control and irradiated chicks are shown. The data indicate that there is almost complete inability to excrete the dye as early as 1 to 2 hr after irradiation. It is suggested that the uric acid increase is the result of renal failure rather than of an important alteration in nitrogen metabolism.

2323

Argonne National Lab.
A PHASE CONTRAST MICROSCOPY STUDY OF X-RAY-INDUCED PYCNOSIS IN THE LIVING CELL (abstract); p.54 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. T. N. Tahmisian and Dorothy M. Adamson. July 1950. 1p. (ANL-4488(p.54))

This section of the report is in abstract form, and is reproduced here in its entirety.

The effect of x radiation ranging from 25,000 to 200,000 r can be kept latent in Melanoplus differentialis embryos for 6 months by maintaining them at submetabolic temperatures. If diapause eggs are irradiated and left at 25°C, pycnosis of

the nuclei takes place by 8 days. When the eggs are irradiated and placed immediately at 0°C and kept at this temperature for 6 months, no morphological or physiological changes are observed upon returning them to 25°C. However, pycnosis occurs by 8 days at 25°C depending not only on the radiation dosage but also on the metabolic activity of the cell. Pycnosis in the living cell, as observed by phase-contrast microscopy, resembles fixed material morphologically. Physiologically there is a difference in the physical state of the nuclei when observed in the living condition. Most nuclei show a drop in viscosity at the time of pycnosis, as judged by the increase in Brownian movement. Vital staining with Janus green indicates that the mitochondria usually clump as a separate body, whereas the chromatin material becomes pycnotic, containing lipoid-impregnated bodies.

2324

Argonne National Lab.
PROGRESS REPORT; THE EFFECT OF ANOXIA ON X-RAY-INDUCED INJURY IN MELANOPLUS DIFFERENTIALIS EMBRYOS; p.55-8 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. T. N. Tahmisian and Dorothy M. Adamson. July 1950. 4p. (ANL-4488(p.55-8))

The purpose of the investigations was to determine the effect of x irradiation on anoxic embryos. Diapause eggs exposed to 25,000 r of x radiation in room atmosphere showed an increase of about 80% in hydroquinone oxidase over a period of 14 days. Eggs exposed to the same dose but in N_2/CO_2 (95/5%) showed a 20% decrease as compared with controls. Embryos that were maintained at 25°C following x irradiation in N_2/CO_2 did not undergo negative growth. However, negative growth was quite pronounced in the embryos that were irradiated in air and maintained at room temperature. The embryos kept at 0°C after irradiation in N_2/CO_2 atmosphere underwent blastokinesis and positive growth when returned to room temperature.

2325

Argonne National Lab.
PRELIMINARY REPORT; AUTOAGGLUTINATION IN PARAMECIUM BURSARIA FOLLOWING EXPOSURE TO ULTRAVIOLET AND TO X-RADIATION. C. F. Ehret. July 1950. 4p. (ANL-4488(p.74-7))

Investigation of the effects of electromagnetic radiations upon the mating reaction of Paramecium bursaria has been extended to the far ultraviolet region. Autoagglutination was recently observed in populations of P. bursaria following exposure to ultraviolet radiations, and some of the results of subsequent investigation of the phenomenon are reported. In summary, the autoagglutination that has been observed following ultraviolet and x irradiation in P. bursaria is grossly similar to the mating-reaction agglutination observed between opposite mating types of sexually reactive normal animals during their light period. Unlike the mating reaction, postultraviolet autoagglutination occurred between animals of the same mating type in their dark as well as in their light period, between animals of sexually immature clones, and between conjugant pairs. Representative stocks (sexually nonphotoperiodic) of three other species of Paramecium showed no postultraviolet autoagglutination.

2326

Argonne National Lab.
PROGRESS REPORT; STUDIES ON THE MECHANISM OF ACTION OF IRRADIATED WATER ON CELL METABOLISM; p.78-81 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. E. S. G. Barron and Betty Redfield. July 1950. 4p. (ANL-4488(p.78-81))

It was shown previously (Barron et al., Biol. Bull. 97, 51-6 (1949)) that the respiration of sea-urchin sperm was inhibited when the cells were suspended in x-irradiated sea water or artificial sea water. The mechanism of this inhibition is still unknown. Possibility of ClOH formation was tested, but none was detected. Consideration of the influence of electrolytes on H_2O_2 formation in x-irradiated water and of effects of x-irradiated water on sperm respiration gave indeterminate results.

2327

Argonne National Lab.
THE ABSENCE OF INHIBITION OF −SH ENZYMES BY MODERATE AMOUNTS OF X RADIATION (abstract); p.92 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. Marjorie Le May. July 1950. 1p. (ANL-4488(p.92))

An experiment has been designed to determine whether the reduced O_2 uptake by rat tissues following irradiation is due to (1) inhibition of −SH enzymes and not to inhibition of other enzymes concerned with complete oxidation of substrates, or (2) failure of the substrate to diffuse as easily in irradiated tissue as in normal tissue. Results of this experiment indicate that x-ray doses that are high enough to cause hematological changes and death in rats do not cause measurable effects in the metabolism of rat kidney slices nor in the enzyme systems studied, including succinic dehydrogenase.

2328

Argonne National Lab.
PRELIMINARY REPORT; THE EFFECT OF X IRRADIATION ON FIGHTING BEHAVIOR IN MALE MICE; p.93-104 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. H. H. Vogel, Jr. July 1950. 12p. (ANL-4488(p.93-104))

Experiments were carried out in order to test the effects of chronic x irradiation upon fighting behavior in male mice. Techniques of training the mice to fight, fighting behavior developed and observed in mice, conditioning of mice to become less aggressive, and irradiation data are reported. In general, all signs of fighting behavior in mice conditioned to fight were not completely suppressed, following irradiation, until shortly before the animal died.

2329

Argonne National Lab.
PRELIMINARY REPORT; A COMPARATIVE STUDY OF RADIATION LETHALITY IN SEVERAL SPECIES OF EXPERIMENTAL ANIMALS IRRADIATED FOR THE DURATION-OF-LIFE; p.105-22 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. July 1950. 18p. (ANL-4488(p.105-22))

An analysis of radiation lethality in metazoan forms has been developed on the basis that (1) many or all aspects of physiological function are affected by radiations, (2) the responses of physiological systems to irradiation, and the interactions between systems are linear, (3) a lethal process arises which is a weighted sum of the injuries to the constituent systems, (4) death occurs when this process intersects with a lethal bound of injury, and (5) when aging is a significant factor, the effects of the aging process and the radiation process combine additively. The further approximation is made that the behavior of a population is described by a representative animal, taken to be the mean or median animal. This latter approximation permits the interpretation of data from small groups of animals, which is carried out in the present paper. The data analyzed were mean survival times at various daily dosages. Data for several species were available. By using the above hypothesis, it has been possible to deduce for each species a cumulant lethality function and an impulse lethality function which describe the course physiological injury would follow consequent to continuous and to single exposures, respectively, if the species behaved according to hypothesis. No internal test of consistency is possible, but determination can be made as to whether the derived lethality functions are consistent with other kinds of information. At least semiquantitative consistency was obtained for several types of comparison. 20 references.

2330

Atomic Energy Project, Rochester Univ.
THE DEGENERATIVE CHANGES IN THE TESTES OF THE ADULT RAT AFTER X-IRRADIATION; p.16-28 of QUARTERLY TECHNICAL REPORT; JULY 1, 1950, THRU SEPTEMBER 30, 1950. K. E. Mason and S. L. Shaver. Nov. 1, 1950. 13p. (UR-142(p.16-28))

The report deals mainly with (a) a study of the degenerative changes in the testes of the adult rat after x irradiation of 500 r total body, (b) the influences of vitamins A, D, and E upon the sensitivity of rats and their genital organs to irradiation, (c) the morphological stages of degeneration in the testes of the rat after the administration of 1005 r locally, (d) the study of the "indirect" factor and its relation to testicular degeneration, and (e) a survey of testicular damage in different strains of rats. It is concluded from the work performed upon this series of animals that with the dose of 500 r administered total body there are no strain differences in the three strains of rats used and that there is very little or no secondary effect upon the testes of these animals. Yet when animals were irradiated locally in this laboratory with the dosage of 500 r, no morphological degeneration was observed in routine histological sections. Therefore the possibility exists that the degeneration in the testes of the rat after 500 r total body may be due to a combined effect of a secondary mediator and the direct effect of the irradiation, neither of which will produce an observable degeneration alone.

2331

ACTION OF 1 : 4-NAPHTHOHYDROQUINONE-DIPHOSPHATE AND ITS 2-METHYL DERIVATIVE ON IRRADIATED AND NON-IRRADIATED RATS WITH JENSEN SARCOMA. E. Friedmann and Norman T. J. Bailey. Biochem. et Biophys. Acta 6, 274-82(1950) Nov.

Neither 1,4-naphthohydroquinone diphosphate nor its 2-methyl derivative has a significant effect on the growth of a nonirradiated Jensen sarcoma in rats. When 1,4-naphthohydroquinone diphosphate is applied in combination with one irradiation of 500 r to rats with Jensen sarcoma the effect is to increase greatly the number of tumors weighing more than 9 g. 1,4-naphthohydroquinone diphosphate appears to inhibit partially the action of x rays (500 r) in 40% of the investigated cases. The result in three cases is analyzed statistically. The preparation of pure 1,4-naphthohydroquinone diphosphate is described. The absorption spectrum of 1,4-naphthohydroquinone diphosphate, determined with a Beckman spectrophotometer, is recorded. (auth)

2332

BIOELECTRIC POTENTIALS AS A MEASURE OF RADIATION INJURY. A. A. Bless. Proc. Natl. Acad. Sci. U. S. 36, 617-23(1950) Nov.

Potentials measured from the tip of the coleoptile to the seed coat have been compared with coleoptile length in wheat seedlings irradiated with up to 6000 r of x irradiation at various ages. Coleoptile lengths in a given group are more homogeneous in value than the corresponding potential measurements. On the other hand, bioelectric potentials are very sensitive to temporary changes in the condition or environment of the organism. It is reasonably safe to say that the average value of the potential of specimens is as good a measure of radiation injury as any other parameter, provided an adequate number of specimens are used. It is possible that a series of readings on one specimen may give as good an indication of radiation injury as a single reading of many specimens.

2333

BIOLOGIC EFFECTS OF RADIOACTIVE PHOSPHORUS POISONING IN RATS. Simon Koletsky and James H. Christie. Am. J. Path. 27, 175-94(1951) Mar.-Apr.

Lethal doses of P^{32} produced extensive morphologic lesions in rats. These were similar to previously described effects of radiation, from either external or internal source, in both animals and man. Similar changes result also from the nitrogen mustards. By virtue of its distribution, P^{32} acted as a powerful hemopoietic poison producing aplasia of the bone marrow and hypoplasia of the lymphoid tissues of the body, including spleen and thymus. This was reflected in the peripheral blood by rapidly developing leukopenia, thrombocytopenia, and anemia. In addition, the intestinal tract, especially the small bowel, and the gonads were sensitive to radiation. Organs such as liver, pancreas, adrenals, kidney, heart, and brain were radioresistant. Destruction of tissue occurred rapidly, being well developed from 6 to 12 hr after injection of the P^{32}. The principal mode of cell destruction was by karyorrhexis. Most of the resulting debris was removed by the 2nd or 3rd day. Involution of the hemopoietic organs was marked at the end of 24 hr and was then progressive over the next several days. During the period of necrosis and involution the animals usually were in good condition and asymptomatic. However, this latent interval was followed by progressive inanition, debility, and weight loss, terminating in death within 3 weeks after administration of the P^{32}. At the time of death there were aplasia of bone

marrow, atrophy of lymphoid tissues, and persistent leukopenia, but the hemopoietic system often revealed beginning or even fairly substantial regeneration; the intestinal damage was largely repaired, whereas the injury to testes was progressive. In animals that recovered there was usually good repair of bone marrow and lymph nodes after a few months. Regeneration was less effective in spleen and thymus, and in the testis generally ranged from slight to negligible. One of the late effects of P^{32} poisoning was the development of malignant neoplasms. The mechanism of radiation death is not established. With massive doses of P^{32}, after which death takes place within a few days, the outcome is usually attributed to a general toxemia resulting from extensive destruction of tissue. With LD_{50} doses of P^{32}, after which death occurs within a few weeks, the almost constant presence of infectious lesions suggests that bacterial toxemia may be significant. 30 references. (auth)

2334

THE CHANGES IN CELL MORPHOLOGY AND HISTOCHEMISTRY OF THE TESTIS FOLLOWING IRRADIATION AND THEIR RELATION TO OTHER INDUCED TESTICULAR CHANGES; II. COMPARISON OF EFFECTS OF DOSES OF 1,440 r AND 5,050 r WITH 300 r. Lloyd C. Fogg and Russell F. Cowing. Cancer Research 11, 81-6(1951) Feb.

Evidence is presented to show that a dose of 1440 r does not destroy all the germinal elements at any time; there is a sequence for radiation reaction from gonium to sperm, and there is an eventual reduction of production. In comparison to 300 r, it is indicated that a single dose of 1440 r further reduces the frequency of the appearance of the germinal cells and delays the time of recovery for spermatogonia and spermatocytes. There is also less evidence of numerical variation in the spermatogonia and spermatocytes and less marked peaks and depressions in the figures. An acute dose of 5050 r destroys all the germinal elements, but all these elements do not disappear at the same time. The gonia disappear first, followed by the spermatocytes, spermatids, and sperm. Once each of the types of germinal elements starts to disappear, the rate is approximately the same, regardless of the dose. The degree of injury is relative to the magnitude of the dose. No marked pathological changes were noted in cells or tissues other than in the true germinal cells. (auth)

2335

EFFECT OF HIGH-VOLTAGE CATHODE RAYS ON ASCORBIC ACID; IN VITRO AND IN SITU EXPERIMENTS. Bernard E. Proctor and John P. O'Meara. Ind. Eng. Chem. 43, 718-21(1951) Mar.

Because ascorbic acid (vitamin C) is an unstable vitamin, the change in ascorbic acid content of a food is used to indicate the extent to which essential food nutrients are destroyed by processing. As part of a research program to determine whether ionizing radiations have potential use in sterilizing foods, the effects of high-voltage cathode rays on ascorbic acid in orange juice (in situ experiments) and on pure ascorbic acid in 0.25% oxalic acid (in vitro experiments) were studied. In all cases, loss of ascorbic acid on irradiation was less in situ than in vitro. Loss of total ascorbic acid was much less than that of l-ascorbic acid. Loss of the latter was negligible when the medium was irradiated in the frozen state. Dilute solutions of ascorbic acid were more sensitive to irradiation than more concentrated solutions. Chemical and spectrophotometric data are presented to show that diketogulonic acid was probably not formed on irradiation. (auth)

2336

EFFECT OF POLONIUM^{210} AND SELENIUM^{75} IN EXPERIMENTAL SCHISTOSOMA MANSONI INFECTION IN MICE. N. P. Watts and K. P. McConnell. Am. J. Hyg. 53, 11-16 (1951) Jan.

Neither α nor γ radiation, as supplied internally by Po^{210} and Se^{75}, have been observed to be damaging to the form of Schistosoma mansoni in the experimental infection in mice. (auth)

2337

EFFECTS OF VARYING OXYGEN TENSION ON MORTALITY OF X-RAYED MICE. George Limperos. J. Franklin Inst. 249, 513-14(1950) June.

An experimental study was made of the effect of oxygen tension on the mortality of x-irradiated mice. Male, white mice were irradiated with 500 r at the rate of 74 r/min under varied oxygen conditions. The results shown indicate that the high-oxygen-content atmosphere increased and that the low-oxygen atmosphere decreased the mortality of mice exposed to x radiation.

2338

THE LOCI OF ACTION OF ULTRA-VIOLET AND X-RADIATION, AND OF PHOTORECOVERY, IN THE EGG AND SPERM OF THE SEA URCHIN. Harold F. Blum, J. Courtland Robinson, and Gordon M. Loos. Proc. Natl. Acad. Sci. U. S. 36, 623-7(1950) Nov.

Given in moderate doses, boti. ultraviolet radiation and x rays delay cell division (cleavage) of the eggs of the sea urchin Arbacia punctulata. Experiments are summarized which indicate that the locus of this action is, in both cases, associated with cell nuclei, as contrasted to cell cytoplasm. There is recovery from the effect of the radiation, as indicated by return toward the normal rate of cleavage. Following treatment with ultraviolet radiation, recovery is accelerated by illumination with "visible" radiation. This photorecovery has its locus in the cytoplasm of the egg. In the case of x irradiation, visible radiation appears to be without effect on the recovery of cleavage rate.

2339

MASCULINIZATION OF XIPHOPHORES FEMALES BY X-IRRADIATION OF THE GONAD. Jean-Henri Vivien. Compt. rend. 231, 1166-8(1950) Nov. 20. (In French)

The gonadal regions of prepuberal female Xiphophorus helleri Heckel fish were x-irradiated with a total of 1200 r, the rest of the body being shielded with lead screens. A characteristic masculine development of the anal and caudal fins is described, although on autopsies made up to 85 days after the irradiation, the ovary appeared normal.

2340

MECHANISM OF PROTECTIVE ACTION OF GLUTATHIONE AGAINST WHOLE BODY IRRADIATION. E. P. Cronkite, G. Brecher, and W. H. Chapman. Proc. Soc. Exptl. Biol. Med. 76, 396-8(1951) Feb.

White Swiss inbred male mice weighing 20 to 24 g were irradiated with the radial beam of a 2.0-Mev x-ray tube. All mice were given 820 r with the exception of the mice in which the testicles were studied. The latter received 750 r. Before irradiation the mice received either 4 mg of glutathione per gram of mouse subcutaneously as a 10% solution at pH 6.5 or isotonic saline in the same volume. The similarity of the glutathione-treated and untreated irradiated mice in respect to their radiosensitive-organ weights, blood counts, and histologic picture during the first 3 to 5 days is highly suggestive that cellular destruction of radiosensitive tissues (bone marrow, thymus, spleen, and testis) is of equal degree in the two groups. It is impossible to prove this conclusively by histologic techniques because a few blasts might survive and be undetected. In contrast to the similarity in the destructive phase the bone marrow, spleen, and thymus regenerated much more rapidly in the glutathione-treated animals as judged by the criteria used.

2341

ON THE NATURE OF THE HYPERTROPHIED PITUITARY GLAND INDUCED IN THE MOUSE BY I^{131} INJECTIONS, AND THE MECHANISM OF ITS DEVELOPMENT. R. C. Goldberg and I. L. Chaikoff. Endocrinology 48, 1-5(1951) Jan.

The enlargement of the pituitary gland of mice injected intraperitoneally with 600 μc of I^{131} has been confirmed. It is shown that this is limited solely to the anterior lobe. Microscopic examination of the anterior lobe revealed a benign hypertrophy and hyperplasia of the basophilic cells. Degranulation of the acidophils also occurs. No cytopathological alterations were observed in posterior or intermediate lobes. The hypertrophy and cytological changes induced in the anterior lobe by the I^{131} injections were prevented by the feeding of desiccated thyroid. It is concluded that the enlargement resulted from the hypothyroidism which followed the destruction of the thyroid by the ionizing radiation. (auth)

2342

PROLONGATION OF SURVIVAL OF SKIN HOMOTRANSPLANTS IN THE RABBIT BY IRRADIATION OF THE HOST. W. J. Dempster, B. Lennox, and J. W. Boag. Brit. J. Exptl. Path. 31, 670-9(1950) Oct.

A dose of 250 r to rabbits given before the application of skin grafts from another rabbit very markedly improved the survival of the grafts. Some improvement in all 16 cases was obtained, and survival of 24 days was produced in one case. The survival of a second set of grafts from the same donor was not improved by irradiation before the first set or even immediately before the second set. The close analogies which can be drawn with the effect of irradiation and the development of antibodies against bacteria are believed to be evidence of the immune-reaction nature of the homotransplant reaction. (auth)

2343

QUANTITATIVE EFFECTS OF RADON IMPLANTED IN THE MEDULLA OBLONGATA; A TECHNIQUE FOR PRODUCING DISCRETE LESIONS. Herbert L. Borison and S. C. Wang. J. Comp. Neurol. 94, 33-53(1951) Feb.

A technique is described for making discrete lesions in the medulla oblongata by implanting radon seeds. The dosages used are less than 1.0 mc for gold seeds and less than 0.15 mc for glass seeds. These are below the usual working range for therapeutic and experimental purposes described in the literature. The relationships between lesion size and total radiation exposure are analyzed. The lesion size for a given radiation value, especially in the case of glass seeds, is predictable with fair accuracy. It is therefore suggested that the method deserves wider application in neurological research. This technique has been applied successfully to produce lesions in the vomiting center located in the lateral reticular formation of the medulla oblongata. It has been shown that dogs do not survive simultaneous bilateral seed implantation in this region if the initial dose per seed is higher than 0.015 mc for glass or 0.4 mc for gold. The corresponding lethal doses respectively in terms of total radiation for each seed is 2 mc-hr (glass) and 40 mc-hr (gold). The chances of survival are improved if the implantation is carried out seriatim in two operations separated by 1 to 2 months. Neurohistological examination of the lesion in the chronic animal revealed that the degenerative changes are restricted to a well-circumscribed region delimited by the margin of demyelination which is surrounded by a zone of glial reaction. The ganglion cells outside of this area are generally normal; only an occasional cell is seen with chromatolysis. (auth)

2344

STUDIES ON THE EFFECT OF RADIOACTIVE PHOSPHORUS ON THE BIOCHEMICAL OXIDATION OF SEWAGE. Werner N. Grune and Rolf Eliassen. Sewage and Ind. Wastes 23, 141-54(1951) Feb.

It has been successfully demonstrated that ordinary tests of sanitary engineering significance may be carried out under radioactive conditions when the proper precautions and safety measures are observed. Radioactive phosphorus, P^{32}, when present in concentrations at or below 10 mc/liter exerts no significant effect in the first stage of the biochemical oxidation of sewage. Results give further evidence that the tentative tolerance level of 10^{-4} μc/liter is safe from the standpoint of the biochemical oxidation of organic matter in streams or other watercourses. 19 references. (auth)

RADIATION HAZARDS AND PROTECTION

2345

Brookhaven National Lab.
PROGRESS REPORT ON WASTE CONCENTRATION STUDIES; III. DECONTAMINATION EFFICIENCY OF THE FILTRATION PROCESS. B. Manowitz and R. H. Bretton. Oct. 1, 1950. 24p. (BNL-90)

A decontamination factor of at least 10^7 (concentrate to effluent) can be obtained by simple evaporation followed

by decntrainment by means of a Fiberglas filter (filtration process). The efficiency of the process is relatively insensitive to observed changes in operating variables. Expressions are given which are considered adequate for a conservative design of a simple submerged coil evaporator with offset condenser, when evaporating a nonvolatile fission-product solution containing fine suspended solids, and for cases of liquid entrainment only, i.e., no suspended solids present, or suspended solids that do not readily adsorb the activities present.

2346

Atomic Energy Commission Training Program
MEDICAL ASPECTS OF ATOMIC WARFARE; MARCH 27-31, 1950. Mar. 1950. 77p. (M-4517)

The program is presented in outline or notation form, according to the following divisions and subtopics: (1) clinical radiation disease: medical picture of the Japanese bombing, the radiation syndrome, radiation effects on blood, histopathology of radiation disease, and fundamentals of genetics in relation to radiation; (2) physics: basic physics, basic physics and fission, and radiation dosage and shielding; (3) principles of radiation health protection: general biologic effects, radiochemistry and isotopes, internal radiation hazards, and instrumentation and radiation detection; (4) principles of therapy: handling of industrial radiation exposure, clinical physiology in relation to trauma and burns, therapy of radiation sickness, and therapy of thermal and radiation burns; (5) large-scale medical problems: epidemiology and control of disease in a devastated area, psychiatric principles in panic, use of antibiotics, large-scale handling of burns and trauma, and triage—practical considerations in the handling of a large catastrophe. 19 references.

2347

Atomic Energy Project, Rochester Univ.
FAST NEUTRON SURVEY OF THE SMALL CYCLOTRON; p.96-125 of QUARTERLY TECHNICAL REPORT; JULY 1, 1950, THRU SEPTEMBER 30, 1950. G. H. Whipple, Jr. Nov. 1, 1950. 30p. (UR-142(p.96-125))

A preliminary report of the fast neutron hazard at the 30-in. cyclotron is given. Throughout three survey runs a large boron trifluoride counter in the control room indicated that, for purposes of the survey, the three runs were identical. In none of the runs was any special target in place. The observed neutrons, therefore, resulted from (p,n) reactions with the tank wall and target gate, both of which are comprised almost entirely of brass. It is evident from tabular data that the maximum neutron energy will be about 6 Mev and that the average energy will be considerably less, possibly between 1 and 2 Mev.

2348

ATOMIC RADIATION HAZARDS FOR FISH. Elmer Higgins. J. Wildlife Management 15, 1-12(1951) Jan.

A discussion covering atomic wastes as a source of radiation exposure, biological effects of acute exposure, radiation levels in contaminated streams, and effects of low-level exposure is presented. It is concluded that aquatic animals are more likely to be exposed to irradiation, through contact with atomic wastes in a few streams, and thus are more subject to damage than are terrestrial animals. Although there is a possibility, through selective absorption, of the concentration of activity in certain tissues of aquatic organisms with attendant localized damage, there is as yet no evidence of pathological conditions caused by radiation in organisms so exposed under natural conditions.

2349

FOOD INSPECTION AND NUCLEAR ENERGY. John H. Rust. J. Am. Vet. Med. Assoc. 118, 135-8(1951) Mar.

Possible intake of radioactive materials by animals to be used as food is discussed. Effects of ionizing radiation on the animals is also considered. In order to reduce the chances of consuming radioactive elements, the following procedures are suggested. In all slaughtering establishments, survey meters should be set along ramps leading to the killing floor. These should be placed in such a way that any animal bearing radioactive material would be detected as it passed. Then, a similar arrangement should be made along the carcass rail and over the moving viscera pans to detect radioactivity in the internal organs that were shielded by the body of the living animal. Survey of processed foods may or may not be feasible, but if it is suspected that animals with radioactivity are passing the "friskers," such a procedure would be advisable.

2350

HAZARDS IN RADIOTHERAPY. B. Jolles. Med. Press 225, 40-3(1951) Jan. 10.

The dangers to which patients are exposed in the administration of ionizing radiation administered for therapeutic purposes are discussed. The physical or biochemical structure and function of the cells exercise an influence on the reaction to radiation, the absorbed quantity of which is also relevant. It is generally accepted that the quantity absorbed, which varies also according to the quality, is only one relevant factor. Cell death and other irreversible changes occur after a threshold tissue-tolerance dose has been delivered, and with smaller doses reversible alterations take place. Vascular changes, connective tissue changes, and disintegration of leucocytes, lymphocytes, and other radiosensitive structures occur with small doses, and on this effect the treatment of many benign pathological conditions is based. Biological dosimetry has not yet afforded the degree of safety desired when delivering a dose of radiation which has to be effective without exceeding the tolerance of the skin and other normal structures through which a beam of rays has to pass before and after it reaches the volume of affected tissues. The degree of safety is greater when single so-called "tumor-lethal" doses are given. The introduction of radioactive isotopes in therapeutics opens up new possibilities, but it also increases the responsibilities of those who administer this type of treatment.

2351

Federal Civil Defense Administration
HEALTH SERVICES AND SPECIAL WEAPONS DEFENSE. Dec. 1950. 260p. (AG-11-1)

Recommendations for the national civil-defense program, including a summary of functional responsibilities for civil-defense health services and special weapons defense were presented in the volume "United States Civil Defense" (Washington, U.S. Government Printing Office, 1950). The present volume elaborates on those responsibilities and sets forth a program for the development of state and local civil-defense health services, where health services refers to medical, surgical, dental, nursing, sanitation, pharmaceutical, veterinary, laboratory (clinical, public health, and x-ray), hospital, radiological, and other related services. Problems of biological and chemical warfare defense, as well as radiological defense are considered.

2352

INTERNATIONAL RECOMMENDATIONS ON RADIOLOGICAL PROTECTION. Radiology 56, 431-9(1951) Mar.

Developments in nuclear physics and their practical applications have greatly increased the number and scope of potential hazards. At the same time, biological research has led to an extension of knowledge of the dangers associated with ionizing radiations. This increase of biological knowledge has not only brought a realization of the importance of certain effects, particularly carcinogenic and genetic effects, but has also provided more information as to the permissible levels of radiation. The International Commission on Radiological Protection has therefore adopted new radiation safety standards with more rigid criteria. The effects to be considered are (1) superficial injuries, (2) general effects on the body, particularly on the blood and blood-forming organs, e.g., production of anemia and leukemias, (3) the induction of malignant tumors, (4) other deleterious effects including cataract, obesity, impaired fertility, and reduction of life span, and (5) genetic effects. Technical points and recommendations considered include exposure to external radiation, exposure to internal radiation, working conditions, general x-ray and radium recommendations, x-ray protective recommendations, electrical precautions in x-ray rooms, film-storage precautions, radium protective recommendations, and recommendations for work by other committees. A supplement on maximum permissible amounts of radioactive isotopes in the human body is included. Appendixes on the standard man and relative biological efficiency (of given radiation based on comparison with the γ radiation from Ra filtered by 0.5 mm of Pt) are attached.

2353

ROENTGEN-RAY PROTECTION. R. Glocker. Z. angew. Phys. 2, 266-71(1950) June. (In German)

The concept of dose and roentgen unit, the different types of x-ray damage, value of tolerance dose, measurement methods, radiation-safe apparatus, shielding materials, and minimum lead thickness for various intensities are reviewed. 15 references.

2354

SOME MEDICAL ASPECTS OF ATOMIC WARFARE. S. R. Burston. Med. J. Australia 38, Vol.I, 281-6(1951) Feb. 24.

In this, the first Rupert Downes Memorial Lecture, in addition to a history of the military career of the World War II Director of Medical Services of the Australian Second Army, the effects of an atomic bomb burst are described based on whether the bomb is exploded in the air above the target, under water, or on the ground. The discussion briefly considers injuries from atomic bombs, treatment, and prophylactic measures. It is concluded that the primary problem, following such an explosion, will be the emergency created by a vast number of casualties from the effects of blasts and burns.

2355

STUDIES OF THE HAZARD INVOLVED IN USE OF C^{14}; III. LONG TERM RETENTION IN BONE. Howard E. Skipper, Constance Nolan, and Linda Simpson. J. Biol. Chem. 189, 159-66(1951) Mar. (See also NSA 3-1330 and 4-4453)

As judged from autoradiographs made from long bones of mice injected with $NaHC^{14}O_3$, the rate of turnover of carbonate carbon by various areas in the bone cross section may be listed as follows: marrow and epiphyseal cartilage metaphysis of the growing end > epiphysis and the nongrowing end > bone shaft (diaphysis). After a period of 4 months the greatest part of the injected C^{14} can be found in the bone. The approximate per cent of the injected dose retained in the skeleton was 0.25 at the end of 24 hr, 0.03 at the end of 1 month, 0.02 at the end of 6 months, and 0.01 at the end of 1 yr. The average skeletal radiation received by mice injected with 18 μc of $NaHC^{14}O_3$ was calculated to be approximately 0.07 rep/day for the period 0 to 24 hr, 0.008 between 2 and 4 weeks, about 0.003 from 5 to 6 months, and 0.002 for the interval 10.8 to 12.7 months. The "active" volume of the bone shaft (as estimated from autoradiographs) was receiving approximately 0.16 rep/day from 1 to 2 weeks after injection of 18 μc of $NaHC^{14}O_3$ and about 0.04 rep/day at from 5 to 6 months. A single injection of 18 μc $NaHC^{14}O_3$ (a 50-mc man-equivalent) has resulted in radiation to certain bone-shaft cells ("active" volume) of mice which is greater than the maximum allowable radiation to tissue for man (0.04 rep/day). 5 figures. (auth)

RADIATION SICKNESS

2356

Atomic Energy Project, Rochester Univ.
THE EFFECT OF AUREOMYCIN ON THE RADIATION SYNDROME IN DOGS. F. W. Furth and M. P. Coulter. Dec. 15, 1950. 18p. (UR-146)

Observations are presented on a group of 24 dogs that were exposed to 450 r of 250-kv x radiation. One-half of these dogs received aureomycin, 100 mg/kg daily beginning immediately after irradiation and continuing for 28 days. The remaining dogs served as controls. Dogs treated post-radiation with clinical doses of aureomycin have shown decreased mortality as compared with the control animals. The onset of morbidity and mortality was delayed for 5 to 7 days in the treated dogs. Pathological studies revealed severe gastrointestinal hemorrhage and ulcerations of the small intestine in the control dogs and minimal gastrointestinal hemorrhage and absence of small-bowel ulcerations in the treated dogs. Bacteriological studies showed a greater number of positive blood cultures in the control animals post-radiation than in the treated animals. Bacteria recovered from autopsy material from the control dogs were

sensitive to aureomycin, while those recovered from the treated dogs were resistant to aureomycin. (auth)

2357

PROBLEMS OF CLINICAL RADIOBIOLOGY. Jorgen E. Thygesen. Radiology 56, 403-7(1951) Mar.

An altered view of the mechanism of the biological effects of ionizing radiation has led to investigations of problems that have hitherto received little attention. In this way a new field, clinical radiobiology, has been opened up. Clinical radiobiology endeavors to fulfill the need of a physiological approach to the problems facing the radiotherapist. In the curative radiotherapy of cancer, where the radiation must often pass through considerable volumes of tissue, the limit of the total dose is set by the tolerance of the organism as a whole. The systemic response of the organism must be checked by measurements on every patient before, during, and after treatment. The radiation tolerance of an individual is defined as his capacity for homeostatic regulation of oxygen transport. Since the ultimate result of severe stress must be anoxia, several problems of clinical importance are closely related to the total hemoglobin and blood volume. For determining the blood volume, Sjostrand's carbon monoxide method is reported to be both exact and rapid. (auth)

RADIOGRAPHY

2358

Argonne National Lab.
PROGRESS REPORT; PREPARATION OF DETAILED RADIOAUTOGRAPHS OF BONE; p.85-6 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. J. S. Arnold. July 1950. 2p. (ANL-4488(p.85-6))

The development of a satisfactory method for preparing detailed radioautographs of α-emitting substances in bone is reported. Absolute acetone is used for fixation since there seems to be little or no leaching out of Pu. Nuclear as well as protoplasmic fixation appears to be satisfactory for cellular recognition, but cellular detail in the final autograph is impossible at the present time. The actual sectioning of bone has been successfully accomplished using an embedding medium of nitrocellulose plasticized with diamylphthalate, using acetone as a solvent. Embedding is accomplished for open bones in 24 to 48 hr under a pressure of 3 atm of N_2 and a temperature of 60°C. Autographs are now being made of rat and dog bones (long bones and vertebrae) containing Pu. The individual α tracks can be traced to the cell or area from which they originated.

RADIOTHERAPY

2359

EFFECTS OF ADRENAL AND GONADAL PRODUCTS ON THE WEIGHT AND THE RADIOIODINE UPTAKE OF THE THYROID GLAND IN THE RAT. William L. Money, Lorraine Kirschner, Leon Kraintz, Priscilla Merrill, and Rulon W. Rawson, in Transactions of the American Goiter Association, 1950, p.213-26. Springfield, Ill., Charles C. Thomas, Publisher, 1951

A procedure for testing the effects of adrenal and gonadal substances on the weight and uptake of I^{131} of the thyroid is presented. Testosterone propionate and progesterone in the dosages used were found to increase the collection of I^{131}. The results suggest that pregnenolone inhibits the ability of the rat thyroid to collect iodine. Estrone was found to increase the collection of iodine, whereas a dose of estradiol benzoate 20 times as great did not influence I^{131} uptake. Both ACTH and cortisone significantly decrease the uptake of I^{131}. It is suggested that epinephrine decreases the uptake of I^{131} in the normal animal. Since formalin did not appreciably influence iodine collection, it is assumed that the compounds were probably not working as alarming stimuli. 24 references. (auth)

2360

ESTIMATION OF DOSE FROM RADIATION APPLICATORS USED IN THE TREATMENT OF CARCINOMA OF THE UTERINE CERVIX. Walter Gaines and Norman E. Scofield. Western J. Surg. Obstet. Gynecol. 59, 71-5(1951) Feb.

Isodose curves have been constructed for a number of intrauterine applicators and cervical plaques commonly used at the University of California Hospital in the treatment of carcinoma of the uterine cervix. The dose of radiation from the various applicators used has been calculated for three arbitrary points in the pelvis and an application time of 54 hr. Depending on the applicator used, the dose varies from 1000 to 5150 r, from 470 to 1012 r, and from 1755 to 12,150 r, at various points indicated. 15 references. (auth)

2361

AN EVALUATION OF RADIOACTIVE IODINE IN THE TREATMENT OF HYPERTHYROIDISM. R. H. Moe, E. E. Adams, J. H. Rule, M. C. Moore, J. E. Kearns, Jr., and D. E. Clark, in Transactions of the American Goiter Association, 1950, p.125-31. Springfield, Ill., Charles C. Thomas, Publisher, 1951.

One hundred cases of hyperthyroidism treated with I^{131} are presented. The method of treatment is discussed. 20 references. (auth)

2362

PRELIMINARY CLINICAL EXPERIENCE WITH THE BETATRON. Roger A. Harvey, Lewis L. Haas, and John S. Laughlin. Radiology 56, 394-402(1951) Mar.

Following a general description of the betatron and related equipment, clinical cases are described. Photographs of the following are presented: the front of the magnet with protective barriers, etc., a water phantom with ionization chamber shown in the window area, plaster-of-Paris and laminated masonite forms of heads for predetermining position for treatment, and cases in progress. An isodose chart made from the phantom with the betatron x-ray beam, and a plot of the correlation between ionization measurements in the masonite head and film-density measurements between the laminations are included.

2363

RADIOISOTOPES IN PHARMACEUTICAL AND MEDICAL STUDIES; I. D. L. Tabern, J. D. Taylor, and G. I. Gleason. Nucleonics 7, No. 5, 3-23(1950) Nov.

Uses for radioisotopes in biology and medicine are indicated under three categories: tracer techniques, diagnosis assistance, and therapeutics. Uses of I^{131} in the therapy of thyroid diseases, P^{32} in the treatment of leukemia, polycythemia, and multiple myeloma, and uses of radioisotopes in tumor localization are outlined. Other diagnostic agents considered are radioactive iron-tagged red cells for determining red cell volume, I^{131}-tagged human serum albumin, Na^{24} for determining blood circulation time, S^{35}-tagged sodium sulfate, etc. Tumor therapy is discussed and cases and statistics of the use of radiotherapy are cited. 122 references.

TOXICOLOGY STUDIES

2364

Argonne National Lab.
URANIUM TOXICITY IN MICE; I. EXPERIMENTAL DESIGN AND RESULTS AT 30 DAYS. Miriam P. Finkel and Gertrude M. Hirsch. Oct. 1950. Decl. Jan. 22, 1951. 10p. (AECD-3045; ANL-4531)

The results of a study of the toxicity of U^{233} in CF-1 female mice are summarized for the first 30 days. The preinjection handling of the mice and the experimental routine were essentially the same as those employed in the long-term polonium mouse experiment (ANL-4401). U^{238} was used as a chemical control and U^{232} as a radiation control. Dosage of U^{233}, injected into a lateral tail vein in the form of $UO_2(NO_3)_2 \cdot 6H_2O$ solution, ranged from 0.0001 to 0.1 μc/g (0.01 to 10 μg/g). The tentative LD_{50} 30-day dose is 0.027 to 0.031 μc/g. 5 figures.

2365

Argonne National Lab.
PROGRESS REPORT; THE EXCRETION OF Sr^{89} BY GOATS; p.11-20 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. S. A. Tyler and Joan Gurian. July 1950. 10p. (ANL-4488 (p.11-20))

In an effort to investigate in greater detail the time distribution of Sr^{89} excretions for goats, an analysis of the time course of excreted radiostrontium for individual goats from data of previous experiments was made, and the interrelationship between individual patterns was noted. Daily excretions (in per cent of the injected dose) were assumed to follow the empirical model $E_t = E_1 t^b$, where E_t is the per cent of the injected dose excreted during day t, t = time in days after injection, and E_1 and b are empirically determined constants. Thus the correspondence $Y = \log E_t$, $X = \log t$ was adopted as the rectifying transformation. The excretion data were corrected for decay on the assumption that all activity consisted of Sr^{89} with a half-life of 55 days. The least-square parameters of the characterizing linear equation based on daily excretion from day 2, $\log E_t = \log E_1 + b \log t$, are tabulated in three tables. The scatter diagram of paired slopes (urine versus feces) is presented, and the dependence of urinary excretion slope on age of animal is illustrated.

2366

Argonne National Lab.
RATE OF CITRIC ACID ACCUMULATION IN TISSUES INDUCED BY FLUOROACETATE ADMINISTRATION; p.87-9 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. J. Schubert, A. Lindenbaum, and Marcia R. White. July 1950. 3p. (ANL-4488(p.87-9))

An investigation of the in vivo accumulation of citric acid, CA, induced by relatively nontoxic amounts of sodium fluoroacetate (NaFA) is reported. Female Sprague-Dawley rats weighing 220 to 260 g were injected intravenously or intraperitoneally with freshly prepared NaFA solutions and sacrificed at intervals by cervical fracture. Several tissues were analyzed for CA. It is noted that the limiting values of the slopes representing CA accumulation are very nearly the same for spleen and heart, as well as for kidney, as time approaches zero.

2367

Argonne National Lab.
PRELIMINARY REPORT; ACTH AND EXPERIMENTAL BERYLLIUM POISONING; p.90-1 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. Marcia R. White, A. J. Finkel, and J. Schubert. July 1950. 2p. (ANL-4488(p.90-1))

The possible use of pituitary adrenocorticotropic hormone (ACTH) in Be poisoning was studied by investigating its effect (1) on the tissue distribution of previously injected tracer Be^7, and (2) on experimental Be poisoning in CF-1 mice. From the results occurring, it is concluded that the reported therapeutic effect of ACTH on the clinical course of berylliosis in the human is not likely a result of elimination or translocation of Be from or within the body.

2368

Argonne National Lab.
PROGRESS REPORT; AIR CONTAMINANTS; p.142 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. H. A. Schultz and R. E. Rowland. July 1950. 1p. (ANL-4488 (p.142))

Investigations of the factors involved in the measurement of traces of freon in the air, development of a dynamic gas handling system, and studies of a spectroscopic method of freon detection are briefly mentioned.

2369

Atomic Energy Project, Rochester Univ.
THE METABOLISM OF POLYPHOSPHATES IN REFERENCE TO THE TREATMENT OF METAL POISONING; p.29-40 of QUARTERLY TECHNICAL REPORT; JULY 1, 1950, THRU SEPTEMBER 30, 1950. R. E. Gosselin, A. Rothstein, H. L. Berke, G. J. Miller, and R. C. Meier. Nov. 1, 1950. 12p. (UR-142(p.29-40))

On the expectation that hexametaphosphate (HMP) might prove efficacious in the treatment of metal poisoning, preliminary observations of its metabolism are presented and compared with the biological behavior of other phosphate

polymers. It is indicated that at the present time only hexametaphosphate is known to protect rats against U poisoning, but in many respects trimetaphosphate looks more promising.

2370

Atomic Energy Project, Rochester Univ.
ANTIDOTAL ACTION OF POLYPHOSPHATES IN URANIUM POISONING, p.52-5 of QUARTERLY TECHNICAL REPORT; JULY 1, 1950, THRU SEPTEMBER 30, 1950. E. A. Maynard, W. L. Downs, and M. F. LeSher. Nov. 1, 1950. 4p. (UR-142(p.52-5))

In preliminary experiments intraperitoneally administered hexametaphosphate appeared to have marked antidotal properties in U-poisoned rats.

2371

Atomic Energy Project, Rochester Univ.
BeF_2 MIST INHALATION STUDY IN ANIMALS AT 2 mg/m³, p.56-71 of QUARTERLY TECHNICAL REPORT; JULY 1, 1950, THRU SEPTEMBER 30, 1950. H. E. Stokinger, L. T. Steadman, F. A. Smith, and R. E. Root. Nov. 1, 1950. 16p. (UR-142(p.56-71))

Information is reported on the amount of Be deposited in the organs of each of 4 species exposed. The data have been arranged in the following manner: (1) the nature of the change in deposition of Be in dogs with time during an exposure period of 207 days (illustrated for the lung, liver, and femur); (2) the comparative deposition of Be in cats and rabbits exposed for 3½ months (relative amounts deposited in the whole organ rather than on the basis of metal concentration in the tissue); (3) the rate of elimination of Be from the tissues after exposure has ceased (data obtained on the rat and comparisons given of tissue content from animals on a regular and restricted dietary intake in 4 periods up to 2.5 months post exposure); and (4) data on both fluoride and Be for tissues of cats and for the blood of dogs at various periods of exposure.

2372

Atomic Energy Project, Rochester Univ.
INHALATION TOXICITY OF THORIUM OXALATE; p.72-5 of QUARTERLY TECHNICAL REPORT; JULY 1, 1950, THRU SEPTEMBER 30, 1950. R. H. Hall. Nov. 1, 1950. 4p. (UR-142(p.72-5))

As a means toward evaluating the nature and extent of this hazard, two experiments have been completed in which dogs, rabbits, and rats were exposed to thorium oxalate dust by inhalation. The sole evidences of toxicity following inhalation of thorium oxalate dust were decreases in the serum Ca concentrations of the dogs and decreases in the number of circulating red blood cells with a concomitant increase of mean corpuscular volume, resembling the development of a macrocytic anemia in the dogs and in one rabbit.

2373

ACTION OF BERYLLIUM SALTS ON REGENERATION IN TRITON. H. Tuchmann-Duplessis. Bull. histol. appl. et tech. microscop. 27, No. 7, 116-17(1950)July-Aug. (In French)

Immediately after amputation of a leg of adult specimens of various species of the salamander Triton (M. cristatus, M. alpestris, and M. palmatus) the cut surface was bathed or immersed in a 1/7N solution of $Be(NO_3)_2$, $BeCO_3$, or beryllium lactate. The temporary inhibition of regeneration by the nitrate and lactate ($BeCO_3$ exhibited no effect in the present experiments) is described in some detail. The Be salts do not seem to affect any particular factor in regeneration. Anomalies of scarring, retraction of soft tissue, and obstruction of the wound by old tissues appear to be primarily responsible for the observed retardation.

2374

THE BACTERIAL SURFACE; II. EFFECT OF URANYL CHLORIDE ON THE ELECTROPHORETIC MOBILITY OF BACTERIA. Kenneth McQuillen. Biochim. et Biophys. Acta 6, 66-78(1950)Sept.

A study has been made of the effect of uranyl chloride (1 to 1000 μM) on the electrophoretic mobility of E. coli, S. aureus, and Strep. faecalis in acetate buffer, pH = 4.7, μ = 0.0001 to 0.01. The negative charge of E. coli and S. aureus is decreased by treatment with uranyl chloride; that of S. faecalis is increased. Phosphate reverses these effects. The surface density of charge of the bacteria has been calculated for various systems. (auth)

2375

CHRONIC BERYLLIUM POISONING (CHRONIC PULMONARY GRANULOMATOSIS); PRELIMINARY REPORTS ON FOUR CASES TREATED WITH ACTH. H. S. Van Ordstrand, Joseph M. De Nardi, and Robert W. Schneider. Cleveland Clinic Quart. 18, 48-54(1951) Jan.

Four case reports, each of a progressive and disabling case of chronic beryllium poisoning, are presented. Each patient was treated with ACTH, and observed for a period of 6 months. At least a moderate degree of temporary improvement has occurred in each case.

2376

FURTHER STUDIES ON THE POSITIVE INOTROPISM OF THE FLUOROACIDS. Donald Bennett, Komol Pengsritong, James R. Weeks, and Maynard B. Chenoweth. Paper presented at the American Society for Pharmacology and Experimental Therapeutics Fall Meeting, Nov. 13-15, 1950.

An abstract of this paper has appeared in J. Pharmacol. Exptl. Therap. 101, 2(1951) Jan. and is reproduced here in its entirety.

Having evidence that sodium fluoroacetate exerts a positive inotropic action on hypodynamic papillary muscles (Federation Proc. 9, 263(1950)), experiments were performed to determine whether higher carbon homologues of this chemical series might have a similar action. Sodium fluorocrotonate has a positive inotropic effect on rabbit papillary muscles at a concentration of 10^{-4}M, while those of the monkey respond similarly at 10^{-3}M. Sodium fluorobutyrate 5×10^{-3}M exerts a very marked positive inotropic effect on monkey papillary muscles. This marked response is very similar to that produced by 1.5×10^{-7}M ouabain in amplitude, onset, and duration of action. Recording methods, whereby the muscle resting length was kept unchanged, de-

monstrate this action to be solely an increase in systolic force of contraction. Other experiments indicate that the fluoroacids cause an increased potassium liberation from cardiac cells like that produced by cardiac glycosides. Using a suitable apparatus (Weeks, J. R.) it has been demonstrated that ouabain or fluorobutyrate increased oxygen consumption of the papillary muscle during the positive inotropic response phase. Butyrate or acetate prevent any response to fluorobutyrate completely; however, subsequent response to ouabain is inhibited. Preliminary studies have begun with a succinic dehydrogenase inhibitor, dehydroacetic acid. This exerts a less marked positive inotropic effect in a concentration of 5×10^{-3} M, and does not inhibit the action of ouabain. Esters of fluoroacids are usually inactive unless an esterase preparation such as rat liver homogenate is added.

2377

HISTOLOGICAL STUDIES OF THE EFFECTS OF BERYLLIUM OXIDE (GLUCINE) ON ANIMAL TISSUES. A. Policard, Brit. J. Ind. Med. 7, 117-21(1950) July.

An abstract by Arnold A. Lear of this paper has appeared in Arch. Ind. Hyg. Occupational Med. 3, 328(1951) Mar. and is reproduced here in its entirety.

Policard investigated the properties of Be to establish the effects of BeO on tissues. Two types of compounds were used, commercial BeO with traces of fluoride impurities and purified BeO. The tissue aggregations of BeO were demonstrated by aniline dyes, polarized light, and microincineration. BeO dusts were introduced into lung, subcutaneous tissues, and peritoneum, and the particles always appeared as agglutinated spherical masses. In the presence of fluoride impurities the cellular response was histiocytic, as with the fluoride-free BeO; however, the traces of fluoride tended to cause local tissue necrosis. The histiocytic hypertrophy and hyperphasia led to formation of characteristic granulomas. The BeO aggregates were slowly absorbed and eliminated, possibly via the histiocytes themselves, but although it has been possible to demonstrate BeO in the kidney and the liver, the intervening stages have not been determined. Comar has pointed out that Be exerts a stimulating action on the reticuloendothelial system; others have shown that Be compounds can block the phosphatases, thereby competing with Mg ions. These studies offer interesting points to follow up in the investigation of tissue response to Be.

2378

OBSERVATIONS ON THE METABOLISM OF POLYPHOSPHATES IN REFERENCE TO THE TREATMENT OF METAL POISONING. R. E. Gosselin, A. Rothstein, H. L. Berke, G. J. Miller, and R. C. Meier. Paper presented at the American Society for Pharmacology and Experimental Therapeutics Fall Meeting, Boston, Nov. 13-15, 1950. An abstract of this paper appeared in J. Pharmacol. Exptl. Therap 101, 14(1951) Jan. and is reproduced here in its entirety.

Polymers of phosphoric acid form stable soluble chelation compounds with most cations, especially polyvalent cations. For example, Rothstein and Meier (1950) report that commercial sodium hexametaphosphate (NaHMP) complexes UO_2^{++} about 300 times more tightly than does citrate (at pH 3.5). On the expectation, suggested independently by H. C. Hodge (1950) and one of us (R. E. G.), that hexametaphosphate might prove efficacious in the treatment of metal poisoning, observations of its mammalian metabolism are presented. Parenteral polyphosphate (NaHMP or a mixed salt CaNaHMP) is demonstrated in blood by a marked rise in the concentration of labile P. Because of in vivo hydrolysis of the polymer, the serum concentration of orthophosphate also rises moderately. Except for the gastrointestinal tract (from which only hydrolyzed phosphate is absorbed), specific sites of in vivo hydrolysis have not been determined, but none occurs in vitro in blood or urine. Hexametaphosphate is rapidly cleared from the blood stream and promptly appears in the urine, partly as labile P (30% dose in rabbits and less in rats) and partly as orthophosphate. Given intraperitoneally (rats) together with 1.0 mg of U/kg as $UO_2(NO_3)_2$, CaNaHMP depresses the urinary excretion of U 50% below control rates. The mechanism of HMP's antidotal action in U poisoning (Maynard, Hodge, Downs, 1950) remains unexplained. These data are compared with preliminary observations on smaller phosphate polymers, which show promise of even greater therapeutic usefulness.

TRACER APPLICATIONS

2379

Argonne National Lab.
PRELIMINARY REPORT; THE EFFECT OF ACUTE ADRENAL INSUFFICIENCY UPON THE RATE OF ABSORPTION AND THE DISTRIBUTION OF PHOSPHORUS IN THE RAT; p.39-44 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. B. V. Hall. July 1950. 5p. (ANL-4488(p.39-44))

Experiments are described concerning the effect of adrenalectomy in rats on the rate of absorption of P^{32}, administered as Na_2HPO_4, from the intestine and its retention by various organs and tissues during the first 40 min following administration. Results described indicate that the syndrome of acute adrenal insufficiency in the rat complicated by NaCl deprivation and starvation, retards, the absorption of P from the intestine and perhaps retards the uptake of the phosphate ion from blood by skeletal muscle.

2380

Atomic Energy Project, Rochester Univ.
THE ROLE OF THE CARBON SKELETON OF LYSINE IN THE BIOSYNTHESIS OF HEMOGLOBIN; p.13-15 of QUARTERLY TECHNICAL REPORT; JULY 1, 1950, THRU SEPTEMBER 30, 1950. K. I. Altman, L. L. Miller, and J. E. Richmond. Nov. 1, 1950. 3p. (UR-142(p.13-15))

Specimens of hemoglobin from the red cells of an anemic-hypoproteinemic dog which was fed ϵ-C^{14}-lysine and allowed to regenerate its blood proteins were examined for C^{14} activity. Protoporphyrin IX dimethylester and globin were isolated from samples taken at various time periods after the lysine feeding (541.6 mg ϵ-C^{14}-lysine containing 440 μc C^{14}). The C^{14} activities found are reported.

2381

Atomic Energy Project, Rochester Univ.
STUDIES IN PROTEIN METABOLISM WITH A C^{14}-LABELED DL-LYSINE; p.79-95 of QUARTERLY TECHNICAL REPORT; JULY 1, 1950, THRU SEPTEMBER 30, 1950. L. L. Miller, C. G. Bly, and W. F. Bale. Nov. 1, 1950. 17p. (UR-142 (p.79-95))

Results of experiments are described which make clear the dominant role of the liver in the synthesis of the plasma protein, and, at the same time, show that a small but significant amount of the plasma globulin fraction is produced by the nonhepatic tissues.

2382

Atomic Energy Project, Rochester Univ.
METABOLISM OF CALCIUM IN NORMAL, RACHITIC, AND VITAMIN D TREATED RATS AS EVIDENCED BY RADIO-CALCIUM (Ca^{45}) STUDIES. H. Hodge, E. Underwood, and S. Fisch. Jan. 15, 1951. 13p. (UR-148)

In agreement with the current theory, the evidence presented favors the view that vitamin D increases the absorption of calcium from the gastrointestinal tract, aids in mobilizing inorganic phosphorus from organic sources, and locally accelerates the mineralization of bone. In addition, vitamin D increases the blood-calcium concentration. Active healing of rachitic bone, as shown by the deposition of Ca^{45}, begins between the 18th and 72nd hr after the administration of the vitamin. (auth)

2383

CORRELATION OF THE 24-HOUR RADIOIODINE UPTAKE OF THE HUMAN THYROID GLAND WITH THE SIX- AND EIGHT-HOUR UPTAKES AND THE "ACCUMULATION GRADIENT." Monte A. Greer. J. Clin. Invest. 30, 301-4 (1951) Mar.

The correlation of the accumulation gradient, 6-hr uptake, and 8-hr uptake with the 24-hr uptake of I^{131} by the thyroid gland has been investigated in euthyroid human subjects. A close correlation has been found to exist between all four functions. If y is taken to represent the 24-hr uptake and x the various other functions, relatively precise formulas can be constructed by means of which the 24-hr uptake can be calculated from any of the other functions and vice versa. Thus, $y = 31.2x - 3.26x^2 \pm 0.141y$ is the formula for the accumulation gradient, $y = 167x \pm 0.129y$ is the formula for the 6-hr uptake, and $y = 1.43x \pm 0.134y$ is the formula for the 8-hr uptake. These correlations hold even when the thyroid gland is suppressed by exogenous thyroid hormone. The data presented here may be of value in future investigations of thyroid physiology in euthyroid subjects. It is suggested that far less correlation would be expected in thyrotoxic subjects. (auth)

2384

DISTRIBUTION OF RADIOACTIVITY IN TISSUES OF NORMAL AND TUMOR-BEARING MICE FOLLOWING INTRAVENOUS ADMINISTRATION OF RADIOIODOTETRAZOLIUM SALT. S. P. Masouredis, M. B. Shimkin, J. A. McMillan, and S. W. Fox. J. Natl. Cancer Inst. 11, 91-6 (1950)Aug.

Radioiodotetrazolium salt, 2,5-diphenyl-3-*p*-I^{131}-iodophenyl-tetrazolium chloride has been synthesized and, in 0.1-mg dose, injected intravenously into normal and tumor-bearing mice. Radioactivity disappeared rapidly from the circulating blood, and was rapidly excreted by the kidney and liver. Transplantable mammary carcinoma and lymphoma contained less radioactivity than most normal tissues.

2385

FACTORS AFFECTING THE FIXATION OF $C^{14}O_2$ BY ANIMAL TISSUES. Robert K. Crane and Eric G. Ball. J. Biol. Chem. 188, 819-32(1951) Feb.

The incorporation of CO_2 into organic linkage by animal tissues has been studied. Unlabeled pyruvate and $C^{14}O_2$ were incubated with tissue for several hours. The residual pyruvate at the end of the experiment was isolated and purified as the 2,4-dinitrophenylhydrazone, and the radioactivity of this derivative was determined. Of the tissues studied under aerobic conditions, pigeon liver slices exhibited the highest rate of fixation. Next in order were duck retina and cattle retina. Rat liver and kidney cortex slices and intact hemidiaphragm showed similar but somewhat lower rates. Slices of rat heart, pigeon heart, or pigeon breast muscle had barely measurable rates. Cattle retina was selected as the most suitable tissue for a detailed study of CO_2 fixation. The rate in this tissue was found to be dependent on the pyruvate and CO_2 concentrations and pH and on conditions of aero- or anaerobiosis. In O_2, the initial rate of fixation is maintained for at least 3 hr, whereas anaerobically the rate decreases throughout the incubation. Maintenance of the initial anaerobic rate is achieved by the addition of glucose. Low concentrations of ammonium ion were observed to inhibit the fixation of CO_2 by cattle retina both aerobically and anaerobically. 24 references. (auth)

2386

INHIBITION OF UPTAKE OF RADIOACTIVE PHOSPHATE BY HUMAN ERYTHROCYTES IN VITRO. D. R. H. Gourley. Am. J. Physiol. 164, 213-20(1951) Jan. 1.

It has been demonstrated that the rate at which P^{32} is taken up by human erythrocytes in vitro is depressed by the addition of IAA (iodoacetic acid) or NaF. A maximum inhibition (to about 20 to 25% of the normal rate) is observed in the presence of 5.0×10^{-4}M IAA or 2.0×10^{-2}M NaF. The inhibitory action of IAA is not reversible and is exerted almost entirely upon P^{32} uptake of the erythrocytes rather than of the white cells and platelets. The presence of higher concentrations of NaF brings about what appears to be a two-phase uptake of P^{32}. The initial phase is a process of rapid diffusion, the rate of which is not affected by a drop in temperature from 37 to 15°C, while the later phase is similar to the depressed chemical mechanism observed in the presence of IAA. A combination of IAA and NaF inhibits the P^{32} uptake to a greater degree than the maximum observed with either of the two alone but does not cause complete inhibition. According to Wilbrandt's data (Pflüger's Arch. ges. Physiol. 243, 519(1940)) the glycolytic system of the erythrocytes is completely inhibited by the concentrations of those substances which have a maximal effect on P^{32} uptake. It is inferred that enzymatic reactions other than the phosphorylating reactions of glycolysis are involved in phosphate transfer in erythrocytes. Sodium azide,

2,4-dinitrophenol, cysteine, and mercuric chloride are without effect on P^{32} uptake. 24 references. (auth)

2387

INTERRELATIONSHIPS OF OXALACETIC AND l-MALIC ACIDS IN CARBON DIOXIDE FIXATION. M. F. Utter. J. Biol. Chem. 188, 847-63(1951) Feb.

The relationship between oxalacetate and l-malate in CO_2 fixation as catalyzed by ATP (oxalacetate carboxylase) and TPN ("malic enzyme") has been studied by comparison of the specific activities of the two acids incubated together in the presence of $C^{14}O_2$ under various conditions. With ATP, oxalacetate has a much higher specific activity than malate at early stages of the reaction. Assuming that an intermediate formed metabolically mixes with the general pool of the substance, these experiments demonstrate that malate is not a precursor of oxalacetate. With longer incubation the specific activities of the two acids approach equality, presumably through the mediation of malic dehydrogenase. Pretreatment with a brain preparation capable of destroying DPN (diphosphopyridine nucleotide) markedly decreases the $C^{14}O_2$ content of the malate but not of the oxalacetate. When TPN is substituted for ATP, CO_2 is fixed principally in malate during the early states of the reaction, indicating that oxalacetate is not a precursor of malate under these circumstances. When both ATP and TPN are added, the distribution of radioactivity between oxalacetate and malate is dependent on the relative concentration of the two cofactors. The total number of counts fixed seems to be relatively constant, suggesting initial fixation in a common precursor. Balance studies showed that no product other than oxalacetate and malate contained a significant amount of C^{14} after short-time CO_2 fixation experiments. By purification the fixation products have been identified as (a) oxalacetate or a substance easily converted to oxalacetate nonenzymatically, and (b) malate. Oxalacetate as analyzed by decarboxylation has been shown to be inhomogeneous with a high-activity fraction present. 25 references. (auth)

2388

METHIONINE REVERSAL OF 2-CHLORO-4-AMINOBENZOIC ACID INHIBITION IN ESCHERICHIA COLI. C. H. Wang, Tsoo E. King, Vernon H. Cheldelin, and Bert E. Christensen. J. Biol. Chem. 188, 753-8(1951) Feb.

Methionine containing C^{14} in the methyl group was synthesized and employed to reverse CAB (2-chloro-4-aminobenzoic acid) inhibition in E. coli. The specific activity of methionine in the cells after growth was approximately the same as in the methionine added to the basal medium. It was, therefore, concluded that synthesis of methionine was completely inhibited by CAB in this organism, even when sufficient exogenous methionine was present to permit good growth. 12 references. (auth)

2389

RADIOISOTOPES IN PHARMACEUTICAL AND MEDICAL STUDIES; II. D. L. Tabern, J. D. Taylor, and G. I. Gleason. Nucleonics 7, No. 6, 40-55(1950) Dec.

In this second of a series of three articles, reference is made to both published and unpublished information on tagged barbiturates, amino acids, and other compounds of interest in metabolism studies. Antigens, antithyroid drugs, membrane permeability, and C^{14} toxicity are also discussed. (auth)

2390

RENAL EXTRACTION RATIO OF RADIOACTIVE DIODRAST IN ANESTHETIZED DOGS. H. D. Bruner. Paper presented at the American Society for Pharmacology and Experimental Therapeutics Fall Meeting, Boston, Nov. 13-15, 1950. An abstract of this paper appeared in J. Pharmacol. Exptl. Therap. 101, 5(1951) Jan. and is reproduced here in its entirety.

Diodrast labeled with I^{131} was synthesized as a means of circumventing the tedious analytical methods in studies of renal hemodyamics and T_m: Liquids containing radiodiodrast can be counted without processing; the count is directly proportional to concentration. After chemical identity of the radiodiodrast was established, samples were tested on dogs anesthetized with pentobarbital, ether, or urethane with the finding that the renal vein concentration averaged 52% of the simultaneous arterial level with range of 11 to 78%; variation occurred between successive samples in the same dog. The doses used in these 152 determinations on 11 dogs ranged between 5 and 173 mg/kg of the acid form and were followed up to 6 hr subsequently so that the data include all the customary dose-concentration ranges.

2391

RESULTS OF EXAMINATION WITH RADIOIODINE OF FIFTEEN MALIGNANT TUMORS OF THE THYROID. M. Dargent, M. Berger, R. Moret, and P. Guinet. Presse méd. 58, 1016-21(1950) Sept. 27. (In French)

Simultaneous external measurement of the in vivo I^{131} radioactivity and measurement of the activity of urinary iodine elimination and of excised tissue is described. Case studies of 15 thyroid-cancerous patients examined with these methods are presented and analyzed in detail. Only one case of important fixation of radioiodine by a cancerous tissue (an acromial metastasis of a trabeculovesicular tissue) was found. The relation between the histological nature of the tissue and its iodine fixation, the action of thiouracil on the tumor, and the restoration of thyroid function following subtotal thyroidectomy are discussed. 12 figures.

2392

THE ROLE OF METHIONINE AS A METHYL DONOR FOR CHOLINE SYNTHESIS IN THE CHICK. K. A. Burke, R. F. Nystrom, and B. Connor Johnson. J. Biol. Chem. 188, 723-8 (1951) Feb.

Methionine containing C^{14} in the methyl group was synthesized and fed to two chicks. The choline, which was isolated from the carcasses of the chicks sacrificed 48 hr later, was found to contain an average of 6.4% of the ingested methionine C^{14}. The expired CO_2 from the chicks was found to contain an average of 14.4% of the ingested methionine C^{14} over the 48-hr period. These data show that the chick is able to utilize the methyl group from methionine for choline synthesis. (auth)

2393

SOME METHODS USED IN TRACING RADIOACTIVE GROWTH-REGULATING SUBSTANCES IN PLANTS. John W. Mitchell and Paul J. Linder. Botan. Gaz. 112, 126-9 (1950) Sept.

An inexpensive applicator made to hold radioactive solutions and mixtures in a pipet at a distance from the operator is described. As little as 0.01 ml of solution can readily be delivered and placed on a plant with this apparatus. A simple method of plating samples of ground radioactive plant tissues on the tacky surface of cellophane is described. The method makes possible the measurement of radioactivity in a weighed sample of ground tissue spread in an even layer essentially one particle in thickness. Evaluation of counts in terms of weight of the tagged compounds was accomplished by impregnating a plated sample of tissue with a known amount of the tagged compound.

2394

A STUDY OF CARBON DIOXIDE FIXATION BY MICROCOCCUS LYSODEIKTICUS. I. Rosabelle McManus. J. Biol. Chem. 188, 729-40(1951) Feb.

Fixation of C^{14}-labeled CO_2 in oxalacetate has been studied with lysed suspensions and cell-free extracts of M. lysodeikticus. Unlike the system occurring in pigeon liver, an actively fixing system to which ATP (adenosine triphosphate) has been added fails to stimulate fixation of CO_2 to any marked degree, although ATP has been shown to be active in the hexokinase reaction and to be formed by the phosphopyruvate transphosphorylase reaction in the bacterial system. From a balance study of the compounds involved in the fixation reaction, as well as an isotope-recovery study, there is no evidence that any net reaction other than the oxalacetic carboxylase reaction has occurred under the experimental conditions employed. A study of the incorporation of labeled CO_2 in oxalacetate and malate indicates a much higher isotope activity in oxalacetate than in malate, with little or no change in the relative distribution of isotope on addition of TPN (triphosphopyridine nucleotide) or DPN (diphosphopyridine nucleotide). Results indicate the nonparticipation of the malic – TPN system in fixation in M. lysodeikticus, fixation apparently occurring by direct incorporation of CO_2 in oxalacetate or a closely related component. 26 references. (auth)

2395

STUDY OF PERIPHERAL CIRCULATION WITH THE AID OF RADIOACTIVE SODIUM. Oskar Eichler, Fritz Linder, and Kurt Schmeiser. Klin. Wochschr. 27, 480-1(1949) July 15. (In German)

Independently of a similar American work (Elkin et al., Surg. Ginecol. Obstet. 87, 1(1948); see Nuclear Science Abstracts NSA 1-718) the authors developed a method for the study of peripheral blood-circulation troubles by injecting a $Na^{24}Cl$ solution into a muscle of a limb and by observing, with the aid of a counter, the rate of the resorption at the point of the injection.

2396

TESTING BLOOD PLASMA TO TISSUE EXCHANGE RATE BY URINE ISOTOPE RATIO: INORGANIC PHOSPHATE. Herbert D. Friedlander and Walter S. Wilde. Am. J. Physiol. 164, 159-66(1951) Jan. 1.

The isotope method of calculating the rate of transfer of substances from the blood plasma to tissues depends on a precise measure of the ratio of the tagged and the nontagged substances in the plasma which are actually physicochemically active in undergoing exchange. This has been tested by measuring the ratio of isotopes accumulated in the urine over a period and comparing it with the ratio of the isotopes in the plasma as averaged over time for the same period. Based on measurements of the acid-soluble phosphate fraction in either system, urine receives two to five times the amount of tracer phosphate ($P^{32}O_4$) predicted from the plasma ratio. Possible explanations are discussed. Ca, based on calculations from other data, yields the predicted ratio in urine. (auth)

2397

UTILIZATION OF DESOXYRIBOSIDES IN THE SYNTHESIS OF POLYNUCLEOTIDES. Peter Reichard and Bengt Estborn. J. Biol. Chem. 188, 839-46(1951) Feb.

N^{15}-desoxyribosides of cytosine, thymine, and hypoxanthine were prepared biologically by allowing Escherichia coli to grow on a synthetic medium containing $N^{15}H_4^+$ and isolating the desoxyribosides from the N^{15}-DNA (desoxyribonucleic acid) formed. The desoxyribosides were injected into rats, and their utilization was studied by N^{15} analysis of purines and pyrimidines from DNA and PNA (ribonucleic acid). Desoxycytidine is utilized for the synthesis of thymine and cytosine in DNA and thymidine for the synthesis of thymine in DNA. Desoxyhypoxanthosine is not utilized for the synthesis of any purines or pyrimidines in polynucleotides. 17 references. (auth)

CHEMISTRY

2398

Ames Lab.
A KINETIC STUDY OF THE PERIODATE ION AND THE PERIODATE-GLYCOL COMPLEX; CONTRIBUTION NO. 76. Frederick R. Duke and Robert F. Bremer. Dec. 20, 1950. 5p. (AECU-1124)

The theory of specific oxidation of glycols by coordinating oxidants provides a method for studying the coordination chemistry of such oxidants. This paper illustrates the application of this method in the simplest case to which it may be applied, the periodate ion. This ion is generally considered to have a coordination number of two, a con-

clusion verified using this kinetic method. It has been shown that periodate oxidizes glycol through the disproportionation of a periodate-glycol complex, and that in 0.008M periodate and 0.2M glycol at 0°C, essentially all the periodate exists in the form of the glycol complex.

2399

Argonne National Lab.
PROGRESS REPORT; RADIOCHEMISTRY; p.82-4 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. John H. Pomeroy. July 1950. 3p. (ANL-4488(p.82-4))

Reduction of cystine-S^{35} to cysteine-S^{35} hydrochloride: Cystine-S^{35} was reduced to cysteine-S^{35} by the use of palladium black and hydrogen, using the general procedure of Bergmann and Michelis (Ber. 63, 987-9(1930)). Irradiation of solutions containing stable free radicals: Recrystallized DPPH (diphenylpicrylhydrazyl) was dissolved in repurified chloroform; the solution contained 26.6 μg/ml. Pyrex capsules containing 5-ml portions of this solution were exposed to successive doses of 100-kv x radiation up to 16,000 r, at the rate of 490 r/min. The optical density of the irradiated samples at 650 mμ dropped from 0.281 at 0 dosage to 0.024 at 2000 r. When plotted on semilogarithmic paper, this gave a straight line passing through six points. There was an abrupt break at 2000 r, and further irradiation diminished the optical density only slightly. The values of optical density are not stable. On standing, the irradiated samples between 0 and 2000 r become still lighter in tint. Preparation of p-chloromercuribenzoic acid: For use as a sulfhydryl group reagent in enzyme studies p-chloromercuribenzoic acid and its Na salts have been prepared, using a modified procedure based on that of Whitmore and Woodward (Org. Syntheses 1, 153-4(1932)). Pressure reactor with temperature control: A pressure reactor has been designed and constructed for use. This will enable bone samples to be embedded at pressures up to 50 psi, at a controlled temperature of 60°C. Under these conditions, the bones are completely impregnated with the embedding plastic, making it possible to section the bones more satisfactorily for making radioautographs to show the distribution of the radioisotopes.

2400

Brookhaven National Lab.
QUARTERLY PROGRESS REPORT; JULY 1 - SEPTEMBER 30, 1950. Nov. 1950. 124p. (BNL-82)

Separate abstracts have been prepared on the following sections of this report; Physics Department, p.1-25; Instrumentation and Health Physics Department, p.26-32; Accelerator Project, p.33-40; Chemistry Department, p. 41-104; Acid and Salt Effects on the Rate of the Ferrous-Ferric Exchange Reaction, p.54-8; Fractionation of the Carbon Isotopes in Decarboxylation Reactions. III. The Relative Rates of Decomposition of Carboxyl-C^{12} and -C^{13} Mesotoic Acids, p.73-81; Fractionation of the Carbon Isotopes in Decarboxylation Reactions. IV. The Relative Rates of Decomposition of 1-C^{12} and 1-C^{13} Trichloracetic Ions, p.82-91; Radiations from I^{126}, p.96-100. Reactor Science and Engineering Department, p.105-10; Biology Department, p.111-20; Medical Department, p.121-2.

2401

Brookhaven National Lab.
CHEMISTRY DEPARTMENT; p.41-104 of QUARTERLY PROGRESS REPORT; JULY 1 - SEPTEMBER 30, 1950. Nov. 1950. 64p. (BNL-82(p.41-104))

Investigations have been carried out in (a) general chemistry of various substances, (b) radiation chemistry, (c) chemical studies with isotopes, and (d) nuclear problems. Considerable progress has been made with the design and construction of a neutron spectrometer. The magnetic susceptibility of cerous fluoride and its temperature dependence have been redetermined; similar measurements have been made on mixtures of cerous and lanthanum fluorides. In radiation chemistry, three lines of investigation have been initiated with the aid of the 2-Mev electrostatic generator. The problem of dosimetry of 2-Mev x rays is being studied. The standard methods of measurement with ionization chambers or with radiation-induced chemical change are found to be less precise than desired; improvements are necessary. The decomposition of aqueous solutions of bromide by x rays is being studied. New results on the kinetics of the electron transfer-exchange reaction between ferrous and ferric ions are reported. In organic chemistry, the mechanism of the Faworskii reaction has been studied with C^{14} tracer. The data give support to a previous conclusion that the reaction proceeds through a symmetrical ring intermediate. In nuclear chemistry, the proportional x-ray counter and pulse height analyzer have been used to measure the internal conversion coefficient of the 35-kev gamma ray of Te^{125}. The result suggests that the process is a mixture of magnetic dipole and electric quadrupole transitions. The decay scheme of I^{126}, which undergoes negative beta decay, electron capture, and positron emission is being studied. The data permit a reevaluation of the γ,n yield of this isotope with 100-Mev x rays and serve to clarify previous work on the trend of γ,n yields with atomic number.

2402

Brookhaven National Lab.
ACID AND SALT EFFECTS ON THE RATE OF THE FERROUS-FERRIC EXCHANGE REACTION; p.54-8 of QUARTERLY PROGRESS REPORT; JULY 1 - SEPTEMBER 30, 1950. J. Silverman and R. W. Dodson. Nov. 1950. 5p. (BNL-82(p.54-8))

The second order character of the ferrous-ferric electron transfer exchange reaction, previously established at $HClO_4$ 0.54 f (formal), 0°C, has been confirmed at $HClO_4$ 0.050 f, 0°C. At constant ionic strength, the rate increases as the acid concentration is decreased in a way that suggests that unhydrolyzed and singly hydrolyzed species participate in the reaction. The rate increases as the ionic strength is increased over the range 0.32 to 1.00 f. At μ = 0.54, the rate is the same whether $NaClO_4$ or $La(ClO_4)_3$ is used to established the ionic strength. (auth)

2403

Brookhaven National Lab.
FRACTIONATION OF THE CARBON ISOTOPES IN DECARBOXYLATION REACTIONS; III. THE RELATIVE RATES OF DECOMPOSITION OF CARBOXYL-C^{12} AND

-C^{13} MESITOIC ACIDS; p.73-81 of QUARTERLY PROGRESS REPORT; JULY 1 - SEPTEMBER 30, 1950. A. A. Bothner-By and J. Bigeleisen. Nov. 1950. 9p. (BNL-82 (p.73-81))

The relative reaction rates of decarboxylation of C^{12}- and C^{13}-carboxyl mesitoic acids have been studied at 61.2 and 92.0°C. The ratios of the rate constants at these temperatures are 1.037 ± 0.003 and 1.032 ± 0.001, respectively. A comparison is made with similar ratios determined experimentally for other acids and with theoretical calculations of the ratios. (auth)

2404

Brookhaven National Lab.
FRACTIONATION OF THE CARBON ISOTOPES IN DECARBOXYLATION REACTIONS; IV. THE RELATIVE RATES OF DECOMPOSITION OF 1-C^{12} AND 1-C^{13} TRICHLORACETATE IONS; p.82-91 of QUARTERLY PROGRESS REPORT; JULY 1 - SEPTEMBER 30, 1950. J. Bigeleisen and T. L. Allen. Nov. 1950. 10p. (BNL-82 (p.82-91))

A precise determination of the relative rates of decomposition of 1-C^{12} and 1-C^{13} trichloracetate ions has been made. The 1-C^{12} ion has been found to decompose 1.0338 ± 0.0007 times as fast as the 1-C^{13} ion into chloroform and bicarbonate at 70.4°C. Trichloracetate ion has been found to undergo a decomposition reaction that gives chloride ion but no CO_2, OH^-, nor H^+. The ratio of the rate constants for the production of Cl^- and bicarbonate is 0.078. The errors in the determination of the effect of isotopic substitution on the rates of chemical reactions are discussed. In the study of the isotopes of carbon, experiments using mass spectrometric analyses of C^{13} are capable of a precision of one order of magnitude better than those in which the specific activity of C^{14} is determined by counting. (auth)

2405

LOW TEMPERATURE HEAT CAPACITIES OF INORGANIC SOLIDS. VII. HEAT CAPACITY AND THERMODYNAMIC FUNCTIONS OF Li_2O. THERMODYNAMICS OF THE Li_2O–H_2O SYSTEM. Herrick L. Johnston and Thomas W. Bauer. J. Am. Chem. Soc. 73, 1119-22(1951) Mar.

The heat capacity of Li_2O has been measured over the temperature range of 16 to 304°K. Graphical integration of the heat-capacity curve yields 9.06 ± 0.03 cal/mole/deg for the entropy at 25°C. When the entropies of LiOH and of steam are also considered, the curve yields a ΔS° of 33.70 ± 0.12 units for the dissociation reaction $2LiOH = Li_2O + H_2O$ (gas). This latter value is in good agreement with the value 33.85 obtained from the dissociation equilibrium and confirms the application of the third law of thermodynamics to Li_2O. A table of thermodynamic functions for Li_2O has been prepared for smoothed values of temperature. Heats and free energies of formation have been computed for LiOH, $LiOH.H_2O$, and Li_2O, by combining their entropies with heat-of-solution and vapor-pressure data. The standard-state entropy of the lithium ion at 25°C, has been calculated to be 2.46 ± 0.34 units, and the standard electrode potential of Li has been calculated to be 3.0383 ± 0.0010 international volts.

2406

THE SYSTEMS COBALTOUS NITRATE–WATER–ACETONE AND COBALTOUS NITRATE–WATER–t-BUTYL ALCOHOL AT 25°. Leonard I. Katzin and John R. Ferraro. J. Am. Chem. Soc. 72, 5451-5(1950) Dec.

The system cobalt nitrate–water–acetone at 25°C shows as equilibrium solids the hexahydrate, tetrahydrate, trihydrate, dihydrate, and (probably) the diacetonate. Several methods of preparation of the tetrahydrate are given, its apparent melting point is determined to be 84°C, and its place in the cobalt nitrate–water binary system is indicated. The system cobalt nitrate–water–t-butyl alcohol at 25°C shows as equilibrium solids the hexahydrate, the tetrahydrate-dialcoholate, the trihydrate-trialcoholate, dihydrate-tetraalcoholate, and the anhydrous tetraalcoholate. Solvation of the cobalt nitrate in the alcohol solution and polymerization in the acetone solution are suggested as explanations of the liquid phase behavior.

ANALYTICAL PROCEDURES

2407

Los Alamos Scientific Lab.
THE DETERMINATION OF NAPHTHALENE IN AIR. M. Chain Robbins. [nd.] 6p. (AECU-1122; LADC-932)

A modified Deniges' reagent has been used for the colorimetric determination of 0.5 to 10 ppm of naphthalene by reacting a suitable aliquot of alcoholic naphthalene solution with 5 ml of the reagent, which contains 1 g of paraformaldehyde in 25 ml of H_2SO_4 and 75 ml of H_3PO_4. The analytical method has a reproducibility of 10%. Its comparative simplicity and sensitivity recommend it for use wherever the determination of naphthalene in air is necessary. Further work is being done on improvements in sampling techniques and control methods.

2408

Brookhaven National Lab.
DETERMINATION OF TOTAL AND RADIOACTIVE CARBON. Donald D. Van Slyke, Robert Steele, and John Plazin. [nd.] 1p. (AECU-1132)

The report is reproduced here in its entirety.

Total carbon is determined by the wet-combustion method of Van Slyke and Folch, with manometric measurement of the CO_2, air-free reagents being used in the manometric chamber so that the zero manometric reading can be determined after ejecting the CO_2. The ejected CO_2 is used for measurement of C^{14} activity. For this two methods have been developed. In Method I the CO_2 is precipitated as $BaCO_3$. The $BaCO_3$ is filtered on a sintered glass disk, and the activity is counted in a methane flow counter. In Method II the CO_2 is transferred to the gas counter developed in this laboratory by Bernstein and Ballentine. Counting in the gas phase has the advantage that there is no self-absorption, the count being a linear function of the amount of $C^{14}O_2$ in the counter. With the $BaCO_3$ counter the useful range of total-carbon sample size is 0.3 to 2.0 mg. Less than 0.3 mg of carbon does not yield enough $BaCO_3$ for uni-

form layers, and because of self-absorption more than 2 mg gives no greater count. With Method II, employing the gas counter, the useful range is 0.1 to 15.0 mg of total carbon. With a given counting time and error, Method II permits measuring a specific carbon activity about 0.01 of that which can be measured by Method I.

2409

Brookhaven National Lab.
THE ANALYSIS AND ISOTOPIC ASSAY OF LABELLED ORGANIC COMPOUNDS. (abstract). R. Christian Anderson. [nd.] 1p. (AECU-1143)

The report is reproduced here in its entirety.

There are many advantages to an analytical method which, on a single 5- to 10-mg sample of an organic compound, will give the C and H percentages and also give, by subsequent manipulation, the C^{13}/C^{12}, D/H, or C^{14} assay. The method is a modification of the work described by Naughton and Frodyma (Anal. Chem. 22, 711(1950)). It involves the dry combustion of the compound in O_2 at atmospheric pressure, and the collection of CO_2 and H_2O by condensation from the mixture $Co_2-H_2O-O_2$ at 3 cm pressure. The CO_2 and H_2O are determined manometrically. These products are then available for the assay procedures, which will be described.

2410

Argonne National Lab.
COLORIMETRIC ESTIMATION OF INDOLEACETIC ACID (abstract); p.68 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. S. A. Gordon and R. P. Weber. July 1950. 1p. (ANL-4488(p.68))

A procedure is given which has been adopted as the most sensitive and specific of the methods studied. The stability of the color formed allows a large number of determinations to be made simultaneously without adherence to a fixed time schedule.

2411

Argonne National Lab.
A MODIFIED DIGESTION-DISTILLATION APPARATUS FOR WET CARBON PROCEDURES (abstract); p.69-73 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. R. E. Stutz and S. A. Gordon. July 1950. 5p. (ANL-4488(p.69-73))

Contamination of $BaCO_3$ by $BaSO_4$ may be prevented in a wet-combustion procedure if the modifications suggested by Steele and Sfortunato (BNL-T-6) are followed. They make use of an intermediate trapping and regeneration stage after combustion and before formation of $BaCO_3$ which frees the CO_2 of SO_2. Apparatus is described which has combined Steele's two stages into a single unit. It is thus unnecessary to transfer the first-stage receiver to a second unit for regeneration of CO_2, reducing the possibility of contamination from atmospheric CO_2. The use of hot and cold water baths to facilitate final diffusion of CO_2 can be eliminated in the present design without excessive time being required for CO_2 diffusion. The capacity of the system has also been increased to permit larger sample sizes, thereby reducing the sampling error. The reagents used are the same as those described by Steele. 2 figures.

2412

New Brunswick Lab.
FLUORIMETRIC DETERMINATION OF ALUMINUM IN BERYLLIUM. Allan R. Eberle and George J. Petretic. Jan. 19, 1951. 10p. (NYO-2014)

A rapid fluorimetric method for the determination of Al in Be metal and BeO has been developed. The reagent used is Pontochrome Blue Black R., which gives an orange-red fluorescence with Al under ultraviolet light. The procedure is essentially the same as that described by Weissler and White (Ind. Eng. Chem. Anal. Ed. 18, 530(1946)), who used the reagent for the determination of Al in steels, bronzes, and minerals. Two methods for the removal of interfering ions are described. The first method describes the removal of Fe by extraction with methyl ethyl ketone. The second and adopted method describes the removal of interferences such as Fe, Ti, and V with cupferron, using chloroform for the extraction of these interferences. (auth)

2413

COLORIMETRIC DETERMINATION OF RHENIUM. Emil E. Malouf and Merwin G. White. Anal. Chem. 23, 497-9 (1951) Mar.

A method is described for the quantitative colorimetric determination of Re in samples containing as little as 0.1 μg to 2.5 mg of Re per gram of sample. Determination of Re have been made in the presence of 125 mg of Mo in a volume of 25 ml. The Mo is separated from the Re as a metal-organic compound formed with ethyl xanthate, and is extracted from a dilute acid solution with an organic solvent mixture. The Re is determined by forming the Re thiocyanate color complex and measuring the transmittance of the solution with an electrophotometer. A precision of ±2% has been obtained over the specified concentration ranges. The method is readily applicable to the mass-analysis techniques of routine analytical laboratories, and permits a rapid and accurate search for Re in minerals. (auth)

2414

DETERMINATION OF LITHIUM IN ROCKS. FLUOROMETRIC METHOD. Charles E. White, Mary H. Fletcher, and Joe Parts. Anal. Chem. 23, 478-81(1951) Mar.

The gravimetric method in general use for the determination of Li is tedious, and the final weighed product often contains other alkali metals. A fluorometric method was developed to shorten the time required for the analysis and to assure that the final determination is for Li alone. This procedure is based on the complex formed between Li and 8-hydroxyquinoline. The fluorescence is developed in a slightly alkaline solution of 95% alcohol, and measurement is made on a photoelectric fluorometer. Separation from the ore is carried out by the wet method or by the distillation procedure. Na and K are removed by alcohol and ether, but complete separation is not necessary. Comparison of analyzed samples shows excellent agreement with spectrographic and gravimetric methods. The fluorometric method

is more rapid than the gravimetric and produces more conclusive results. Another useful application is in the preparation of standard Li solutions from reagent-quality salts when a known standard is available. In this case no separations are necessary. (auth)

2415

DETERMINATION OF SODIUM AND POTASSIUM IN LITHIUM METAL BY FLAME PHOTOMETER. W. R. Inman, R. A. Rogers, and J. A. Fournier. Anal. Chem. 23, 482-3(1951) Mar.

The unusual properties of Li metal have caused the recent interest in its use in metallurgy. Na and K are the chief impurities usually found in Li metal. In the course of work on the refining of Li a rapid and accurate method was required for determining very small amounts of these contaminants. The flame photometer proved satisfactory for the analyses. It was possible to determine as little as 0.001% of both Na and K. No separations were necessary because the small negative error due to the presence of Li could be dealt with by means of a correction curve. The analyses could be easily completed within 2 hr. The production of Li of high purity for use in light alloys is of importance in metallurgy. In certain light alloys containing Li the tolerance for Na is very low, and the Li is considered to be the major source of this impurity. The method could be modified for the determination of Na and K in such alloys. (auth)

2416

m-CRESOXYACETIC ACID, A SELECTIVE REAGENT FOR ZIRCONIUM. M. Venkataramaniah and Bh. S. V. Raghava Rao. Anal. Chem. 23, 539-40(1951) Mar. (Note)

m-Cresoxyacetic acid is described as a reagent that is easily prepared and purified (Koelsch, J. Am. Chem. Soc. 53, 304(1931)). From solutions 0.20N to 0.25N in HCl, Zr can be precipitated quantitatively in the presence of a number of elements, including Th. This paper describes the use of this reagent for the selective precipitation of Zr. The precipitate is voluminous and settles quickly. As little as 2 mg Zr oxide gives a precipitate large enough for convenient handling.

2417

Department of Mines and Tech. Surveys, Mines Branch, Ottawa
REPORT ON RAPID, COLORIMETRIC METHOD FOR URANIUM ANALYSIS, TO BE USED IN PLANT CONTROL WORK. Grace Brackenbury. Jan. 5, 1951. 3p. (NP-1939; TR-75/51)

The main advantages of the described colorimetric method are (1) rapidity (an analysis on a liquid sample may be completed in 15 min), (2) inexpensiveness (no equipment except the original outlay of a spectrophotometer), (3) can be used by an inexperienced technician after a few days training. The method depends on the development of the uranium peroxide color in alkaline solution, and coagulation of the iron precipitated under these conditions.

2418

THIRD ANNUAL REVIEW OF ANALYTICAL CHEMISTRY; NUCLEONICS. Charles L. Gordon. Anal. Chem. 23, 81-6 (1951) Jan.

The publications of the past two years in the field of nucleonics that relate essentially to the problems of analysis are reviewed. Three main sections deal with the effects peculiar to the radioactive systems used in studying analytical processes, methods of analyses and separations, and measurement techniques. The peculiarities of the techniques of radioactive analyses arise mainly from the extreme dilution of the solutions, the disruptive force of the disintegration process, or the slightly different chemical characteristics of the isotopes. Studies of the effects arising from these phenomena on the stability of solutions are discussed under the headings of (1) surface reactions, (2) chemical effects of radiation, and (3) isotopic effects, respectively. Activation analysis, radiochemical activity analysis, and carrier-free separations are discussed. Reference to counting efficiency, absorption, scattering, instruments for measuring radioactivity, photographic techniques, and disposal of radioactive wastes are included. 122 references.

2419

VOLUMETRIC DETERMINATION OF THORIUM BY HIGH FREQUENCY TITRIMETRY. W. J. Blaedel and H. V. Malmstadt. Anal. Chem. 23, 471-5(1951) Mar.

This investigation was undertaken to illustrate how conventional analytical procedures may be simplified or shortened by use of high-frequency titration. An indirect volumetric method for the determination of Th using high-frequency titrimetry is described. Oxalic acid and Th nitrate standard solutions are used. The end point is sharp, stoichiometric, and reproducible to a few hundredths of a milliliter of 0.025M Th nitrate. Some substances such as Ti and Zr, which interfere quantitatively in gravimetric methods, may be present in small amounts without causing appreciable error. Th analyses may be carried out in a shorter time than by conventional methods, especially in the presence of certain interferences. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

2420

Radiation Lab., Univ. of California
THE CRYSTAL STRUCTURE OF THORIUM NITRATE. D. H. Templeton and Carol H. Dauben. Nov. 20, 1950. Decl. Jan. 23, 1951. 4p. (AECD-3044; UCRL-1016)

Thorium nitrate, $Th(NO_3)_4.6H_2O$ is orthorhombic with a = 11.2, b = 22.8, and c = 10.6 A. The space group is $Fdd-C_{2v}^{19}$, and there are eight molecules in the unit cell. Only the unit cell and thorium positions have been determined. (auth)

2421

Ames Lab.
THE STRUCTURE OF TETRAMETHYLAMMONIUM PEN-

TAIODIDE. Ralph J. Hach and R. E. Rundle. Dec. 15, 1950. 28p. (ISC-122)

Tetramethylammonium pentaiodide is end-centered monoclinic with $a_0 = 13.34$, $b_0 = 13.59$, $c_0 = 8.90$ A, $\beta = 107°50'$, $\rho_{calcd} = 3.06$, Z = 4. The structure, based on space group C2/c, consists of nearly square iodine nets within which V-shaped I_5^- ions can be distinguished. Iodine-iodine distances within the ion are 2.91 and 3.09 A, vs. 2.87 A for the sum of the covalent radii. Other I-I distances within one net are 3.62 A or greater, while the nets are 4.3 A apart. The structure of the I_5^- ion bears no relation to the square ICl_4^- ion, where the I−Cl distance is close to the sum of the covalent radii. It is suggested that iodide does not tend to use its d orbitals above the valence shell for covalent bonds with iodine, and that complex ions result from the interaction of an iodide ion with polarizable iodine molecules. Resonating structures result in enough covalent character of the iodide-iodine bond to weaken the iodine-iodine bond. The relation between polyhalide ions and "polyiodine" polymer complexes is discussed briefly. (auth)

2422

Cornell Univ.
STRUCTURES OF FLUOROCARBONS, ELEMENTARY BORON, AND BORON COMPOUNDS. J. L. Hoard. Oct. 1, 1950. 6p. (NYO-715)

Structural studies of the fluorocarbon C_8F_{12}, elementary boron, B-trichloroborazole, and dimethylaminoborine (dimer) are in progress. The structural determination for B-trichloroborazole has reached the final stage of refinement. Complete x-ray data have been obtained for C_8F_{12} and for boron. Both structures are quite complex, and their determination is dependent on success in the next and most critical stage of finding trial structures suitable for refinement by successive approximations. (auth)

2423

Radiation Lab., Univ. of California
THE CRYSTAL STRUCTURE OF POTASSIUM BROMORHENATE. D. H. Templeton and Carol H. Dauben. Nov. 16, 1950. 12p. (UCRL-1012)

K_2ReBr_6 has a face-centered cubic lattice with a = 10.445 ± 0.005 A. It is isostructural with K_2PtCl_6. The parameter for the bromine atoms has been determined to be x = 0.242 ± 0.004, corresponding to a Re−Br distance of 2.53 A. (auth)

2424

Atomic Energy Research Establishment
THE CRYSTAL STRUCTURE OF THE COMPOUND UMn_2 and A DISCUSSION ON LAVES PHASES IN URANIUM ALLOYS. P. J. Bowles, T. S. Hutchison, P. C. L. Pfeil, and M. B. Waldron. Oct. 1950. 12p. (AERE-M/R-581)

It has been shown that the compound existing in the U-Mn system at 67 at.% Mn is based on the formula UMn_2. Its structure as determined by x-ray analysis is face-centered cubic with a = 7.146 ± 0.001 A. The space group is $Fd_3m-O_h^7$. The number of molecules per unit cell is 8; the 8 uranium atoms are in the special position 8 (a) and the 16 manganese atoms in the positions 16 (d). The size-factor relationship of UMn_2 is within the range typical of Laves phases. If U is assumed to be effectively divalent and if Mn, Fe, Co, and Ni are ascribed valences in the region of 0.7, 0.7, 1.5, and 2.0, respectively, an explanation can be given of the occurrence and structure of many of the intermetallic compounds in terms of Brillouin zone theory of Laves phases.

2425

ON THE MAXIMA OF THE PATTERSON FUNCTIONS. Philip Hartman and Aurel Wintner. Phys. Rev. 81, 271-73 (1951) Jan. 15.

For the case of a one-dimensional crystal (and, therefore, in three dimensions as well) it is possible to construct a counter-example, realizing the following situation: the electron density is the sum of two monatomic distributions, but the number of peaks in Patterson's diagram exceeds three, whereas the standard rule would claim at most three such peaks. Consequently, the usual "addition rule of peaks" is false as a general mathematical theorem. It follows that the explanation of the empirical success of this rule in crystallography lacks, to date, a mathematical basis, that is, a nonempirical foundation. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

2426

THE DIRECT DETERMINATION OF THE CRITICAL TEMPERATURE AND CRITICAL PRESSURE OF NORMAL DEUTERIUM. VAPOR PRESSURES BETWEEN THE BOILING AND CRITICAL POINTS. Abraham Solomon Friedman, David White, and Herrick L. Johnston. J. Am. Chem. Soc. 73, 1310-11(1951) Mar.

Critical constants for pure normal D_2 have been obtained by a slight extrapolation from direct measurements on normal D_2 of 99.7 at.% purity. The corrected values are 38.35°K and 16.432 atm, respectively. Vapor pressures of 99.7% D_2 have been measured between 29°K and the triple point. The vapor pressure of D_2 from the triple point to the critical point can be represented by the equation, $\log p_{atm} = 3.57979 - 74.2894/T - 0.029345T + 0.00047507T^2$. Critical constants of normal D_2 exceed those of normal H_2 by 5.11° and 3.635 atm, respectively.

FLUORINE AND FLUORINE COMPOUNDS

2427

THE FORMATION OF COMPLEX FLUORIDES. PART II. REACTIONS IN ANHYDROUS HYDROGEN FLUORIDE AND IODINE PENTAFLUORIDE. A. A. Woolf. J. Chem. Soc., 3678-81(1950) Dec.

The formation of complex fluorides by neutralization-type reactions in hydrogen fluoride and iodine pentafluoride has been demonstrated by the following reactions: $K^+ HF_2^- + H_2F^+BF_4^- = KBF_4 + 3HF$ and $K^+ IF_6^- + IF_4^+SbF_6^- = KSbF_6 + 2IF_5$. The conductivities of some fluorides and oxy-salts in iodine pentafluoride have been measured. (auth)

2428

THE HETEROLYTIC FISSION OF THE CARBON–IODINE BOND IN TRIFLUOROIODOMETHANE. J. Banus, H. J. Emeléus, and R. N. Haszeldine. J. Chem. Soc., 61-4(1951) Jan.

Trifluoroiodomethane reacts with KOH, alone or in solution in solvents of high dielectric constant, to give fluoroform, I being replaced by a positive I mechanism. Nucleophilic substitution of the I by OH, NH_2, CN, and NO_2 has so far proved impossible. The exchange reaction between iodide and trifluoroiodomethane in alcoholic solution at 20°C has been studied by using radioactive I^{131} as a tracer. The reaction is of first order with respect to the trifluoroiodomethane and of zero order with respect to the iodide. The rate-determining step at low temperatures is believed to be the heterolysis of the C–I bond to give a trifluoromethyl anion and an I cation. (auth)

2429

ORGANIC FLUORIDES. PART VI. THE CHEMICAL AND PHYSICAL PROPERTIES OF CERTAIN FLUOROCARBONS. R. N. Haszeldine and F. Smith. J. Chem. Soc., 603-8(1951) Feb.

The boiling points, densities, refractive indexes, and surface tensions of a number of fluorocarbons have been determined, and the variations of certain of these properties with temperature have been investigated. The pure fluorocarbons available were: in the n-perfluoroparaffin series, C_7F_{16}, C_8F_{18}, C_9F_{20}, $C_{10}F_{22}$, $C_{11}F_{24}$, $C_{12}F_{26}$, and $C_{16}F_{34}$; the following monocyclic compounds, C_7F_{14}, C_8F_{16} (from m-xylene), C_9F_{18} (from mesitylene), and $C_{10}F_{20}$ (from p-cymene); and two bicyclic compounds, $C_{10}F_{18}$ (from naphthalene) and $C_{11}F_{20}$ (from 2-methylnaphthalene).

2430

AN ORIENTATION ON THE ENERGY OF FORMATION OF THE LOWER-VALENT ALUMINUM HALIDES. F. Irmann. Helv. Chim. Acta 33, 1449-57(1950) Oct. 16. (In German)

The heats of formation of the fluorides, chlorides, bromides, and iodides of mono- and divalent aluminum have been calculated on the basis of available data and by consideration of analogous compounds. Both solid and liquid Al(I) compounds are, in contrast to the common trihalides, only slightly unstable; in the gas phase they decompose only at high temperatures. No such definite statement may be made concerning the Al(II) halides; their existence at low temperatures is not very probable. The stabilities of the gaseous monohalides decrease from fluoride to iodide in constrast to the usual case, whereas for the solid state, the stabilities remain practically constant.

LABORATORIES AND EQUIPMENT

2431

A SMALL SELF-CONTAINED LABORATORY FOR RADIOISOTOPE STUDIES IN EXPERIMENTAL ANIMALS. Reidar F. Sognnaes and James H. Shaw. Arch. Ind. Hyg. Occupational Med. 3, 316-22(1951) Mar. (New instruments and technics)

The construction, cost, and operation of a laboratory for making radioisotope studies in experimental animals are discussed. The unit is relatively small and inexpensive, yet fairly complete for operation on a university level. The facilities required for biological radioisotope work are arranged within a small segregated area so that experiments can be conducted from beginning to end without the need of transferring animals, specimens, or chemicals to any other part of the surrounding building. (auth)

PERIODIC SYSTEMS

2432

ON THE RATIONAL REPRESENTATION OF THE PERIODIC SYSTEM OF THE ELEMENTS; trans. from Zhur. Obshcheĭ Khim. 19, No. 6 (1949). A. E. Shtandyel. 1949 3p. (NP-2259)

A method of constructing the table is proposed which, in the opinion of the author, unites the requirements for simplicity and convenience, and at the same time gives the electronic structure of the elements. The elements are placed on horizontal lines from the bottom up. This method of constructing the table corresponds to the gradual increase in complication of the atom, and to the energy levels given by the usual scheme. Every horizontal line corresponds to a definite increase of the level, shown at the left side of the table. The levels are distributed, not in the order of their principal and secondary quantum numbers, but in the order in which they are actually filled with respect to their energy values. This sort of distribution permits one to see at a glance the process of formation of the periods, and in addition, agrees with the usual distribution of elements according to adjacent horizontal lines. In order to preserve the basic principle of gradual filling of one or another level, the levels 5d and 6d are written twice, as they are filled in two different ways.

RADIATION CHEMISTRY

2433

Arkansas Univ.
CHEMICAL EFFECTS OF NUCLEAR TRANSFORMATIONS; ANNUAL PROGRESS REPORT. Raymond R. Edwards. Mar. 15, 1950. 20p. (ORO-10)

Results of investigations of chemical changes accompanying spontaneous and induced nuclear transformations are reported. Work on the rupture of covalent bonds resulting from recoil or ionization processes accompanying β decay of a constituent atom and studied with Pb^{210} as tetramethyl lead is described. Proportional-counting equipment for use in the study of the decay scheme of Pb^{210} has been fabricated and tested. Results of an investigation of the efficiency of exchange of radioactive recoil atoms produced by the (n,p) process with bound atoms as a function of bond type, molecular structure, and nature of the irradiated medium are reported. An efficiency of not more than 0.5% for the exchange of recoil C^{14} atoms with normal C atoms of the pyridine ring is indicated. Using C^{14} as a tracer, results of experiments indicate that the livers of folic-acid-fed birds are capable of transforming glycine to serine much more rapidly than those from deficient birds. Results of pre-

liminary experiments using carboxyl-labeled glycine as a substrate for chick bone marrow are included.

RADIATION EFFECTS

2434

Argonne National Lab.
PROGRESS REPORT; CHEMICAL DOSIMETRY, p.65-7 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. Austin M. Brues, Director. July 1950. 3p. (ANL-4488(p.65-7))

In the course of a study of growth-hormone inactivation by ionizing radiation, it became necessary to evaluate the total energy absorbed by irregular glass volumes subjected to external x radiation. The auxin indoleacetic acid (IAA) is smoothly inactivated by x radiation, the reaction proceeding with first-order kinetics. Moreover, IAA can be assayed in rather low concentrations by the $FeCl_3$–$HClO_4$ method which is described. Utilization of IAA as a quantitative chemical dosimeter thus is suggested. With suitable phantoms, a method is evolved which should be applicable to the measurement of integral doses received by irregular volumes, or the absorption of heterogeneous radiation. Graphic data on the residual concentration and inactivated amount of IAA as a function of x-ray dose are included.

2435

ACTION OF IONIZING RADIATIONS ON WATER AND AQUEOUS SOLUTIONS. Conclusion. Marc Lefort. J. chim. phys. 47, 776-94(1950) Sept.-Oct. (In French)

Continuing a detailed study of the oxidations and reductions in α- or x-irradiated solutions (J. chim. phys. 47, 624-43 (1950) July-Aug.; see NSA 4-6344), the author reports investigations on KI, I_2, nitrite-nitrate, and leucofluorescein-fluorescein solutions. The effects of total radiation dose, initial concentration, temperature, pH, and formation of H_2O_2 are described. Detailed theoretical interpretations of the results obtained are presented.

2436

DISSOCIATION OF SODIUM CHLORIDE BY ELECTRON BOMBARDMENT. James B. Newman. Virginia J. Sci. (New series) 1, 341(1950) Sept.

The article is reproduced here in its entirety.

In mass-spectrographic analysis of a solid, ions are usually obtained either by heating the sample directly and subsequently ionizing the evaporated material or by bombarding the sample with an electron beam and ionizing the emitted atoms with a second beam. The question arose as to whether in the latter method the bombarding electron beam removes materials from the sample entirely by a thermal process. Dart (Thesis, Cornell University, 1946) observed an enhancement in evaporated material from ZnO under electron bombardment above that expected from purely thermal evaporation. This conflicted with subsequent work and opinion of Plumlee (Report, Ninth Annual Conference on Physical Electronics, M.I.I., Apr. 1949) that no such enhancement occurred. This question has been investigated by a method other than that previously employed. With constant energy put into the sample by the electron beam, the relationship between observed loss of mass of the sample and the bombarding electron velocity should give some indication as to the mechanism for removal of material from the sample. NaCl was chosen as the substance bombarded. The results indicate that the greater part of the material removed is evaporated through a thermal process, and, although there is evidence for an enhancement of evaporation under electron bombardment this evidence could not be considered conclusive.

2437

EFFECT OF X-IRRADIATION ON THE HYALURONIDASE–HYALURONIC ACID SYSTEM. Melvin D. Schoenberg, Robert E. Brooks, John J. Hall, and Herman Schneiderman. Arch. Biochem. 30, 333-40(1951) Feb. (See also NSA 4-5662)

X-irradiation causes a reduction in viscosity of vitreous and umbilical cord hyaluronate solutions and a continuing loss in viscosity after cessation of the irradiation. X-irradiation causes a marked decrease in the average molecular weight. The half-time values for irradiated hyaluronate are greater than for nonirradiated hyaluronate. There is a decrease in the activity of x-irradiated hyaluronidase solutions. (auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

2438

THE METHOD OF MOLECULAR SPECTRA AND THE FRACTIONATING OF THE RARE EARTHS; trans. from Spectrochim. Acta 1, 249-69(1939). G. Piccardi; trans. Joe G. Raeber. 1939. 42p. (NP-2244)

Reasons are listed in favor of direct visual spectrochemical analysis even of those rare earths which have no characteristic absorption spectra within the visual range. The respective earth oxides were excited by gas flame to emit sensitive bands. Details of the method are described. The results of this procedure are satisfactory with Sc, Y, La, and Gd for both qualitative and quantitative analysis. For Sm and Eu the method is still applicable. While separating a mixture of rare earths consisting of bromates of Nd, Sm, Eu, Gd, Tb, Dy, Ho, Y, etc., the author could observe by his method two new bands of which one probably belongs to DyO.

SEPARATION PROCEDURES

2439

Argonne National Laboratory
ISOLATION OF PROTACTINIUM. R. Elson, G. W. Mason, D. F. Peppard, P. A. Sellers, and M. H. Studier. Dec. 11, 1950. Decl. Feb. 5, 1951. 5p. (AECD-3058; ANL-WMM-748)

A procedure for the isolation of Pa^{231} which is relatively fast and simple and potentially capable of yielding gram quantities is presented. An aqueous waste stream of the Mallinckrodt process for the extraction of U from pitchblende concentrate was contacted with tributyl phosphate. The tributyl phosphate extract was then contacted with HF,

which precipitated fluoride-insoluble impurities and left the Pa in the aqueous supernatant. Pa was extracted from the fluoride solution with diisopropyl carbinol after the fluoride was complexed with Al ion and the acidity was adjusted with $NaAlO_3$. The carbinol extract was washed, and the Pa was reextracted into aqueous H_2O_2. Further purification consisted of removal of U by ether extractions, precipitation of Pu with tannic acid, and solvent extraction cycles with diisopropyl ketone. Experimental details and yields are given.

2440

THE EFFICIENCY OF A URANIUM-X-SEPARATION METHOD. J. B. Th. Aten and F. Barendregt. Physica 16, 760-6(1950) Oct.

By means of a G-M counter for radioactive fluids the efficiency of the separation of UX was determined. The efficiency for the ether-water separation method proved to be about 95%, that of the ammonium-carbonate-iron method about 70%. Removal of the iron with NH_4SCN and ether gave a loss of UX of about 5.5%. To avoid adsorption of UX to the glass the glassware was treated with concentrated HCl. Some indications for the preparation of a carrier-free UX source on mica are given. (auth)

2441

Chemical Research Lab., Teddington
INVESTIGATIONS ON THE PRECIPITATION OF URANIUM AND OTHER METALS FROM SOLUTION; PART VI. CHROMIUM, TITANIUM, AND CERIUM. T. V. Arden and Jeanette Harbutt. Aug. 1950. 15p. (CRL-AE-65)

The precipitation of Cr, Ti, and Ce from sulfate solution by NaOH has been studied using potentiometric and conductimetric techniques. The effects of phosphate, arsenate, and fluoride ions have been determined. (auth)

2442

THE USE OF DITHIZONE TO SEPARATE AND PURIFY RADIUM D, RADIUM E, AND POLONIUM. Georges Bouissieres and Christiane Ferradini. Anal. Chim. Acta 4, 610-14(1950) Dec. (In French)

With the help of RaD (Pb^{210}) and RaE (Bi^{210}) as indicators, the experimental data on diphenylthiocarbazone (dithizone) complexes of Pb and Bi have been checked and extended. The conditions of formation of a Po dithizone complex have been determined. The results have been applied in the separation and purification of the elements of active Ra deposits. (auth)

SYNTHESES

2443

Atomic Energy Project, Univ. of California, Los Angeles
SYNTHESIS OF TRANS-5-OCTENOIC ACID. David R. Howton and Robert H. Davis. Jan. 26, 1951. 14p. (UCLA-106)

Reduction of the Na salt of 5-octynoic acid by means of a solution of metallic Na in liquid ammonia was found to yield trans-5-octenoic acid. This was shown to be identical with the product obtained by a two-carbon elaboration of trans-3-hexenoic acid via the malonic-ester synthesis. (auth)

2444

CARBON-14 SYNTHETIC STUDIES. 2-METHYL-1,4-NAPHTHOQUINONE-8-C^{14}. Clair J. Collins. J. Am. Chem. Soc. 73, 1038-39(1951) Mar.

2-Methyl-1,4-naphthoquinone-8-C^{14} has been synthesized from 4-(p-tolyl)-butanoic-1-C^{14} acid. The acid has been prepared by a new method, involving carbonation with $C^{14}O_2$ of β-(p-tolyl)-propylmagnesium bromide. The over-all yield, based on CO_2, was 25%. An apparatus useful for the carbonation of Grignard reagents with $C^{14}O_2$ of high specific activity is described.

2445

THE DISTRIBUTION AND EXCRETION OF STILBAMIDINE-C^{14} IN MICE. James C. Reid and John C. Weaver. Cancer Research 11, 188-92(1951) Mar.

Stilbamidine (stilbene-4,4'-dicarboxamidine) diisethionate labeled with C^{14} has been prepared, and its distribution in mice has been studied. After intravenous administration, 70% is excreted within 4 days, the remainder being excreted much more slowly, reaching 97% on the 30th day. Much of the excreted material has undergone chemical transformation. Excretion occurs via the urine and feces. The highest concentration of radioactivity appears in the kidneys, liver, heart, lungs, and intestines. Traces of radioactivity are detectable in many tissues 6 months after injection. Stilbamidine is not metabolized to CO_2 in the mouse. (auth)

2446

THE PREPARATION OF C^{14}-LABELED VITAMIN B^{12} (C^{14}-COBALAMIN). George E. Boxer, James C. Rickards, Charles Rosenblum, and David T. Woodbury. Arch. Biochem. 30, 470-1(1951) Feb. (Letter to the editor)

Recent reports have demonstrated that vitamin B_{12} is a cyano complex of cobalt, that vitamin B_{12a} is obtained upon removal of the cyano group, and that treatment with cyanide reconverts B_{12a} to B_{12}. This interconversion offers a method for introducing C^{14} into the cyano group of B_{12}. Vitamin B_{12a}, produced by a photochemical procedure was treated with $HC^{14}N$ of a specific activity of 1 mc/mole, and the resulting B_{12} was crystallized from acetone. It is estimated that the specific activity of the $C^{14}N$-labeled vitamin B_{12} is about 0.6 μc/mg.

2447

THE PREPARATION OF GLUTAMINE LABELED WITH N^{15}. Donald W. Hood, Carl M. Lyman, and Freeman A. Tatum. Arch. Biochem. 30, 351-2(1951) Feb.

Glutamine containing an amide group with 23.3 at. % excess N^{15} was prepared from common red beets (Beta vulgaris) which were treated with isotopically labeled ammonium nitrate. The α-amino group contained 3.42 at. % excess N^{15}. (auth)

TRACER APPLICATIONS

2448

DETERMINATION OF PENICILLIN G USING C^{13} ISOTOPE AS A TRACER. John T. Craig, J. B. Tindall, and Murray Senkus. Anal. Chem. 23, 332-3(1951) Feb.

A precise method was developed for the determination of penicillin G in relatively impure samples of penicillin broth and crystalline samples. Labeled potassium benzylpencillinate was enriched with respect to C^{13} at the carbon attached to the benzyl group. The enrichment in analytical samples was determined by hydrolysis of the penicillin to phenylacetic acid, followed by decarboxylation of the acid to CO_2. The C^{13} content of the gas sample was determined in a mass spectrometer. The method of analysis should prove to be of great value in developing and improving processes for the isolation of penicillin G. The analysis of a broth is of special significance in this connection, inasmuch as it reveals the amount of pencillin G per unit volume. A biological assay of broth can be obtained, but these data cannot be used to calculate the pencillin G content. (auth)

2449

STABLE ISOTOPE DILUTION METHOD FOR NICOTINIC ACID DETERMINATION. N. R. Trenner, R. W. Walker, Byron Arison, and Carol Trumbauer. Anal. Chem. 23, 487-90(1951) Mar.

The application of the isotope dilution technique to the determination of nicotinic acid was developed because it became necessary to assay accurately for the nicotinic acid content of crude products known to contain substantial amounts of other compounds containing pyridine rings, and because a review of the literature revealed the existence of no analytical method which would not be seriously affected by the presence of such impurities. A stable isotope dilution method is described in which deuteronicotinic acid is used as the tracer and its dilution is determined by infrared spectrophotometry. The method provides an absolute assay for nicotinic acid in complex mixtures, and has the general significance for analytical chemistry of further illustrating the importance of the isotope dilution principle in the development of specific (absolute) assay methods, a field which has been neglected in the past. (auth)

TRANSURANIC ELEMENTS AND COMPOUNDS

2450

Radiation Lab., Univ. of California
THE OCCURRENCE OF PLUTONIUM IN NATURE. Charles A. Levine and Glenn T. Seaborg. Nov. 29, 1950. Decl. Jan. 23, 1951. 26p. (AECD-3043; UCRL-1025)

Plutonium has been chemically separated from seven different ores, and the ratio of Pu to U has been determined. This ratio was found to be fairly constant in pitchblende and monazite ores, in which the U content varied from 50 to 0.24%. All the plutonium obtained was Pu^{239}, probably formed by the U^{238} in the ore capturing neutrons and decaying as $U^{238} + n \rightarrow U^{239} \xrightarrow{\beta^-} Np^{239} \xrightarrow{\beta^-} Pu^{239}$. The sources of neutrons include the spontaneous fission of uranium, (α,n) reactions caused by the action of α particles from the heavy radioactive elements on the nuclei of light elements in the ore, and cosmic rays. In the cases of pitchblende ores, the spontaneous fission of uranium and (α,n) reactions contribute the major portion of the neutrons. In Th ores which contain a low abundance of U, neutrons from (α,n) reactions are probably dominant. The lower concentration of Pu in carnotite and fergusonite is a result of the presence of neutron-absorbing impurities in these ores. No isotopes of Pu other than Pu^{239} were found. An upper limit for Pu^{238} in Canadian and Belgian Congo pitchblendes was set at 1 part Pu^{238} in 4×10^{18} parts ore. An upper limit for the hypothetical Pu^{244} in Brazilian monazite was set (assuming a half-life of 10^8 yr for Pu^{244}) at 1 part Pu^{244} in 3.6×10^{11} parts ore. It is postulated that U^{233} and the "missing" Np (4n + 1) radioactive series are present in nature in minute quantities, formed by the absorption of neutrons by Th^{232}, thus: $Th^{232} + n \rightarrow Th^{233} \xrightarrow{\beta^-} Pa^{233} \xrightarrow{\beta^-} U^{233}$. Smaller amounts of Np^{237}, from the reactions $U^{236}(n,2n)U^{237} \xrightarrow{\beta^-} Np^{237}$, are also present. The amounts of transplutonium elements present in nature seem to be too small to detect by present means unless some unknown, very long-lived isotopes exist. (auth)

URANIUM AND URANIUM COMPOUNDS

2451

Atomic Energy Project, Rochester Univ.
THE RELATION OF OPTICAL DENSITY TO QUANTITY OF UO_2 DEPOSITED ON FILTER PAPER, p.76-8 of QUARTERLY TECHNICAL REPORT; JULY 1, 1950 THRU SEPTEMBER 30, 1950. H. B. Wilson and G. Sylvester. Nov. 1, 1950. 3p. (UR-142(p.76-8))

A satisfactory correlation between the optical density of a deposit of UO_2 on filter paper and the amount deposited is determined. Optical density is defined as the difference between density of filter papers plus deposit and that of the filter papers alone. The investigations show that optical density varies widely with particle size. It is also apparent, however, that for a given particle size range there is a reasonably good and possibly useful relationship between quantity of UO_2 and corresponding optical density.

ENGINEERING

2452

Stanford Research Inst.
THE INDUSTRIAL UTILIZATION OF FISSION PRODUCTS. (Gross, Mixed, and Separated) A PROSPECTUS FOR MANAGEMENT. Mar. 1951. 48p. (AECU-1269)

It is possible that chemically pure radioelements could be extracted from gross fission products at a moderate cost if a sufficient demand were developed. Fission products are expected to be available in 100,000 c quantities. The cost per curie of fission products in large quantities is estimated

to be in the range of 1/100th to 1/1000th of the price of most presently available radioactive materials. Certain possible uses of such large amounts of low-cost radiation are: sterilization of foods and drugs in their containers without heat; production of new or cheaper chemicals by radiation-induced reactions; production of improved static eliminators, more efficient fluorescent lights, and new types of luminescent paints and tiles; greater utilization of radiography; and numerous tracer applications.

2453

ESTABLISHING AN INDUSTRIAL RADIOISOTOPE PROGRAM. J. R. Carlin and W. C. Nusbaum. Chem. Inds. 67, 886-9 (1950) Dec.

Attention is called to the various factors and requisites which should be considered in the application of isotopes to industrial fields. Problems are discussed pertaining to procurement, laboratory facilities, health hazards, AEC regulations, etc., which would be pertinent in the establishment of a radioisotope program.

HEAT TRANSFER AND FLUID FLOW

2454

Babcock and Wilcox Co.
EROSION AND HEAT TRANSFER WITH LIQUID METALS; PROGRESS REPORT V; APRIL 16-MAY 17, 1950. May 18, 1950. 9p. (NEPA-1423)

Work has continued on calibration of flowmeters to be used in heat-transfer studies with Li. The Li melt-pot charging apparatus has been completed. An electromagnetic pump to be used in Li-erosion studies was designed and tested with Hg, and a second pump is now under construction. An isothermal erosion loop for operation with Li at 1000°F was designed and is ready for operation. Fire-extinguishing agents were tested for reaction with burning Li. An apparatus to compare the electrical resistivities of Li and stainless steel for purposes of flowmeter and pump design is now under construction. A sampling device for use in the test loop is described.

2455

Columbia Univ.
HEAT TRANSFER BY NATURAL CONVECTION FROM HORIZONTAL CYLINDERS TO LIQUID METALS; SECOND QUARTERLY PROGRESS REPORT FOR OCTOBER 1, 1950-DECEMBER 31, 1950. Seymour C. Hyman, D. Palazzo, Shih J. Wang, and Charles F. Bonilla. Dec. 31, 1950. 10p. (NYO-562)

Preliminary heat-transfer coefficients to molten bismuth have been obtained, but agreement with previous metals on the usual correlation is poor, and the work will be repeated. An additional dimensionless ratio improves the correlation of the liquid-metal data, but not the water data. Further work on the surface-temperature-averaging thermocouple, on natural convection from a hot fluid to a cold horizontal cylinder, and on simultaneous natural and forced convection from a heated horizontal cylinder is described. (auth)

2456

Division of Engineering Research, Univ. of California
CALCULATIONS RELATIVE TO THE THERMAL ENTRY LENGTH FOR FLUIDS OF LOW PRANDTL NUMBER. R. A. Seban and T. Shimazaki. Jan. 10, 1950. 28p. (NP-1852)

Calculations are presented for the variation of the heat-transfer coefficient in the region downstream from the point at which a fluid of constant properties, having uniform initial temperature and a velocity distribution characteristic of fully developed pipe flow, is subjected to a constant wall temperature different than the initial fluid temperature. The determination of heat-transfer coefficient is made for a Prandtl Number of 0.01 and Reynold's Numbers of 10^4 and 10^5. The results indicate thermal entry lengths that are substantially shorter than indicated by the analysis of Sanders (M.S. Thesis, Univ. of Calif., Berkeley, Calif., (1946); Martinelli, Trans. Am. Soc. Mech. Engrs., 947-59 (1947) Nov.).

2457

Rensselaer Polytechnic Inst.
A PRELIMINARY INVESTIGATION OF THE ANALOGY OF THE TRANSFER OF VORTICITY TO THE TRANSFER OF HEAT IN FLUIDS OF LOW PRANDTL NUMBER. R. G. Kennison, Jr. May 25, 1950. 55p. (NP-1946; ATI-86249)

A theoretical analysis is presented of heat-transfer-film coefficients of liquids in which an analogy is made between the transfer of vorticity and the transfer of heat. Film coefficients are predicted at the fluid-solid interface for fluids of low Prandtl moduli flowing turbulently in a long straight pipe. It is found that correspondence with experimental data is good at low Reynolds and Prandtl numbers and becomes progressively poorer as either is increased. It was found that the eddy diffusivity for vorticity is approximately equal to the eddy diffusivity for momentum over about half of the turbulent core, and becomes much smaller than the eddy diffusivity for momentum as the wall is approached. The mean mixing length for turbulence is presented for both the momentum and vorticity theory and is found to be roughly proportional to the distance from the pipe wall. (auth)

2458

PRESSURE DROP THROUGH STACKED SPHERES. EFFECT OF ORIENTATION. J. J. Martin, W. L. McCabe, and C. C. Monrad. Chem. Eng. Progress 47, 91-4 (1951) Feb.

Orientation has been shown to have a definite effect on pressure drop through stacked spheres. Thus, orientation differences can account for the variation in pressure drop through beds of particles of the same porosity. Such differences will be greatest when comparing packings where orientation can be preferred or directed, such as stacked Raschig rings and dumped Raschig rings. For these a single porosity correlation might be seriously in error.

2459

Lewis Flight Propulsion Lab.
TEMPERATURE DISTRIBUTION IN INTERNALLY HEATED WALLS OF HEAT EXCHANGERS COMPOSED OF NON-

CIRCULAR FLOW PASSAGES. E. R. G. Eckert and George M. Low. Jan. 1951. 39p. (NACA-TN-2257)

A method for the determination of temperature distributions and heat-transfer characteristics of a special type of heat exchanger is developed. The heat exchanger is composed of polygonal flow passages, and the passage walls are heated uniformly by internal heat sources. The coolant flow within the passages is assumed to be turbulent. The circumferential variation of the local heat-transfer coefficients is estimated from flow measurements made by Nikuradse, postulating similarity between velocity and temperature fields. Calculations of temperature distributions based on these heat-transfer coefficients are carried out, and results for heat exchangers with triangular and rectangular passages are presented. (auth)

2460

National Advisory Committee for Aeronautics
TURBULENCE AND HEAT STRATIFICATION; trans from Z. angew. Math. u. Mech. 15, No. 6, 313-38(1935) Dec. H. Schlichting; tr. by J. Vanier. Oct. 1950. 55p. (NACA-TM-1262)

With applications to meteorology in view, the method of small oscillations is used to investigate the stability of a plane laminar boundary layer in which the density depends in a special way on the distance from the plate. It is found that for a constant Froude number the flow becomes more stable as the Richardson number increases until, at a critical value of the Richardson number that depends on the Froude number, the flow is stable for all disturbance wavelengths and Reynolds numbers. The calculated results are verified by experiment. (auth)

MATERIALS TESTING

2461

North American Aviation, Inc.
MEASUREMENT OF YOUNG'S MODULUS OF GRADE AUF GRAPHITE AT ELEVATED TEMPERATURES. L. Green, Jr. Dec. 7, 1950. 15p. (NAA-SR-98)

The Young's modulus of grade AUF extruded graphite was measured as a function of temperature and direction relative to the axis of extrusion. The magnitude of the modulus in the direction of extrusion was found to be roughly three times that measured in directions perpendicular to the axis. The modulus was found to increase with temperature, its magnitude at 2000°C in the parallel and perpendicular directions being about 35 and 100% (respectively) greater than the room-temperature values. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

2462

Department of Metallurgy, Massachusetts Inst. of Tech.
THE MEASUREMENT OF THERMAL CONDUCTIVITY OF REFRACTORY MATERIALS; PROGRESS REPORT FOR OCTOBER 1 TO DECEMBER 31, 1950. F. H. Norton, W. D. Kingery, D. M. Fellows, M. Adams, M. C. McQuarrie, R. L. Coble, J. Francl, T. Vasilos, and H. H. Anderson. Jan. 10, 1951. 22p. (NYO-597)

Measurement of thermal conductivity of a second sample of stabilized zirconia completes work on this material in the low and intermediate temperature ranges. Additional data have been obtained for alumina, magnesia, and insulating-brick specimens. In addition to alumina, zirconia, and magnesia, work has been initiated in the forming of other pure crystalline materials. Dense samples of pure mullite have been formed, and satisfactory casting procedures for zircon have been worked out. The synthesis and forming of pure crystalline spinel are being investigated.

2463

Alfred Univ.
PERIODIC STATUS REPORT NO. 24; FUNDAMENTAL PROPERTIES OF METAL-CERAMIC MIXTURES AT HIGH TEMPERATURES; PROGRESS DURING PERIOD DECEMBER 1, 1950, TO JANUARY 31, 1951. W. B. Crandall and W. G. Lawrence. Jan. 31, 1951. 12p. (NP-1949)

Variations in the hot-pressing techniques were developed resulting in a more efficient production of dense specimens with low graphite pick-up and a negligible amount of carbide formation. Oxidation resistance was determined on a number of two- and three-component systems. Oxide-layer investigations have been continued to establish a minimum in oxide-layer penetration rate versus temperature curve and correlation between low- and high-porosity mechanisms. The theory of thermal stresses in brittle materials has been extended to include the effect of shear stresses, with emphasis placed on developing a method for measuring the thermal shock resistance of a body. The influence on the thermal shock resistance of compressive, tensile, and shear strengths, modulus of elasticity, coefficient of expansion, thermal conductivity, thermal diffusivity, surface heat-transfer coefficient, size, and time has been examined in detail. (auth)

2464

Air Materiel Command
PROPERTIES AND PHYSICAL CONSTANTS DATA OF HIGH REFRACTORY MATERIALS. Eugene Ryschkewitsch. Aug. 1950. 30p. (AF-TR-6330)

Data on the properties and physical constants of high-refractory elements, oxides, carbides, nitrides, and combinations are presented. (auth)

METALS AND METALLURGY

2465

Pittsburgh Univ.
PROGRESS REPORT FOR OCTOBER 1, 1950 – JANUARY 1,

1951; THE APPLICATION OF CHEMICAL THERMODYNAMICS TO THE STUDY OF METALLIC ALLOY FORMATION; THE HEATS OF FORMATION OF CERTAIN MAGNESIUM-CADMIUM ALLOYS AT 25°C. W. E. Wallace and T. M. Buck, Jr. Jan. 3, 1951. 13p. (NYO-751)

The heats of formation of four Mg – Cd alloys in composition ranges corresponding to $MgCd_3$, MgCd, and Mg_2Cd have been measured by a differential calorimetric method. A preliminary comparison with results expected from the quasi-chemical theory has been made. A tentative value for the heat of reduction of chloroplatinite ion to platinum in acid solution has also been obtained. (auth)

2466

General Electric Research Lab.
FUNDAMENTAL RESEARCH IN PHYSICAL METALLURGY; EIGHTH QUARTERLY REPORT; PROGRESS REPORT NUMBER 25. J. H. Hollomon and D. Turnbull. Jan. 5, 1951 9p. (SO-2012; RL-487; RD-1)

Experiments are in progress to determine whether or not inert markers move during the interdiffusion of a couple formed by putting two single crystals together. The possibility of using the mass spectrometer as the detector for vapor-pressure measurements is under investigation. If successful, this method may be applied to the measurement of activity coefficients in alloys and to the measurement of solid-surface energies. (auth)

2467

Radiation Lab., Univ. of California
SILVER PLATING ON INCONEL. Leslie J. Cook. Dec. 18, 1950. 4p. (UCRL-1068)

A method of electroplating silver onto inconel is described. The deposits produced by this method have excellent adherence and are very fine grained. Films as thin as 0.0002 in. have been produced with an electrical conductivity of the order of 95% of the value for pure bulk silver. (auth)

2468

A CALCULATION OF THE ELASTIC CONSTANTS OF ALUMINUM. R. S. Leigh. Phil. Mag. (7) 42, 139-55 (1951) Feb.

A calculation is made of the elastic constants of Al which correspond to pure shears without change of volume, and an explanation is given for the fact that Al crystals are almost elastically isotropic. Conclusions are drawn about the nature of the density of states near the Fermi surface, and it is shown how the elastic constants may be expected to depend on electron concentration in Al solid solutions. (auth)

2469

CORROSION. Mars G. Fontana. Ind. Eng. Chem. 43, 69A-70A, 72A(1951) Jan.

Properly treated Ti-stabilized 18-8S stainless steel is equivalent to Nb-stabilized material for most practical purposes. Photographs show the stabilizing effect of Ti and the elimination of the so-called "weld decay zone" in as-welded ⅜-in. plate, the structure of Ti-bearing 18-8S with 0.14% Al when quenched-annealed from 1950°F, the same field after sensitizing for 2 hr at 1250°F in vacuum, and attack on sigma in the ferrite as a result of exposure to boiling 65% HNO_3 for 1 hr. A table shows the effect of heating for 4 hr at 1700°F before sensitizing.

2470

CORROSION RESISTANCE OF ANODIZED AND UNANODIZED TITANIUM. EFFECT OF COMMON MINERAL ACID SOLUTIONS. Chuk-Ching Ma and Ernest M. Peres, Jr. Ind. Eng. Chem. 43, 675-9(1951) Mar.

The corrosion rates of anodized and unanodized Ti in acid solutions of various strength were determined by the alternate-immersion corrosion test at 35°C. All tests were conducted at a cycle of 2 min 38 sec for 96 hr. In addition the behavior of anodized and unanodized metals in selected acid solutions at the boiling points were investigated by the total-immersion corrosion test, without aeration. Because no Ti anodization condition was available in the literature, it was necessary to evaluate the protective films formed under various conditions. A 15-min treatment at 20°C with a current density of 3.6 amp/sq in. at 7 volts in a 15% H_2SO_4 solution resulted in a film that was satisfactory for the purpose of this investigation. The corrosion resistance of Ti was found to depend more on the oxidizing, reducing, or "neutral" (i.e., neither oxidizing nor reducing) tendencies of the corrosive medium to which it was subjected than on the concentration of the medium. In oxidizing media both anodized and unanodized Ti were equally resistant to attack at all concentrations and temperatures tested. In reducing media both were readily attacked at about the same rate. In neutral media the anodized metal was at once seen to be superior to the unanodized in resisting attack by acids. (auth)

2471

DETERMINATION OF OXYGEN IN ZIRCONIUM METAL BY THE VACUUM FUSION METHOD. J. K. Stanley, Joan von Hoene, and George Wiener. Anal. Chem. 23, 377-9(1951) Feb. (Note)

The vacuum-fusion method depends on the reduction of the oxides by C in the fluid metal; the CO formed is converted into CO_2, and this is then measured in terms of its pressure exerted in a calibrated volume. The apparatus used has been described by McGeary et al. (Trans. Am. Soc. Metals 42, 900-16(1950)). Procedure, preparation of samples, and a table of typical results are included.

2472

DUCTILE ZIRCONIUM. W. W. Stephens and J. H. McClain. Chem. Eng. 58, 116-17(1951) Mar.

The Kroll process for the production of ductile Zr is presented. The process consists essentially in reducing $ZrCl_4$ with molten Mg. At present, it is a batch-type operation with production of approximately 150 lb of Zr sponge per batch from a raw chloride charge of 420 lb and using 100 lb of Mg for reduction. Equipment and layout in the new plant have been designed to permit easy modification to a system whereby gaseous $ZrCl_4$ would be passed through a heated pipe from the purification to the reduction furnace and molten $MgCl_2$ would be trapped from the re-

duction crucible, permitting production of larger batches of metal in the same equipment with reduced labor and equipment costs.

2473

ELECTROLYTIC POLISHING AND OXIDATION OF TITANIUM; APPLICATIONS TO EXAMINATION OF MICROGRAPHIC STRUCTURES. Pierre-A. Jacquet. Compt. rend. 232, 71-3(1951) Jan. 3. (In French)

A method for rapid electrolytic polishing of Ti of any purity and of its alloys is presented which permits the observation of the actual micrographic structures. The polished surface may be etched by the usual acids. Anodic oxidation produces thin films of oxide, the colors of which depend on the crystallographic characteristics. 2 figures.

2474

Naval Research Lab.
ELECTRON MICROSCOPY OF METAL SAMPLES BY REPLICA TECHNIQUES. L. S. Birks and R. T. Seal. June 15, 1950. 9p. (NRL-3693)

With the present transmission-type electron microscope, the only method of observing the structure of gross metal specimens is by the replica technique. The first part of this report is a comparison of several variations of the replica technique applied to steel specimens in an attempt to determine which gives optimum results for the work at the Naval Research Laboratory. The second part of the report describes a technique for observing exactly the same area in the electron and the light microscopes. A desired area may thus be found in the light microscope and then observed with the greater resolution and magnification of the electron microscope. 6 figures. (auth)

2475

THE OXIDATION OF LITHIUM AND THE ALKALINE EARTH METALS IN LIQUID AMMONIA. Joseph K. Thompson and Jacob Kleinberg. J. Am. Chem. Soc. 73, 1243-5(1951) Mar.

Solutions of the metals Li, Ca, Sr, and Ba have been rapidly oxidized by two methods, which are designated as the "one-cell method" and the "two-cell method." The former consists in oxidation by dropping the metal sample directly into O_2-saturated liquid NH_3; whereas the latter method consists in dissolving the metal in NH_3 and then slowly passing this solution into a cell containing O_2-saturated liquid NH_3 so that oxidation is instantaneous. All the metals react to yield chiefly monoxide and small percentages of peroxide; no higher oxides are found in the products. All the metals yield small amounts of amide as indicated by the presence of nitrite in the oxidation products. In the case of the alkaline earth metals the products contain traces of unreacted metal as shown by the evolution of H_2 upon addition of water. Li, when rapidly oxidized in liquid ammonia at −78°C, forms a bright lemon-yellow solution. Measurements of the absorption spectra of oxidized solutions of Li, Na, and K show that all have absorption bands reasonably close to the same wave length, 380 mμ. Since Na and K are known to form superoxides upon rapid oxidation in liquid NH_3, the similarity of their absorption spectra with that of Li supports the postulate that the latter forms a superoxide which is stable in liquid NH_3 solution at −78°C. Electrolysis of $MgBr_2$ in liquid NH_3 between a Mg anode and a Pt cathode yields blue solutions of the ionized metal. Oxidation of such solutions results in the formation of small amounts of peroxide; faint, but positive tests for nitrite are also obtained.

2476

Battelle Memorial Inst.
QUARTERLY PROGRESS REPORT ON ALLOYS FOR HIGH-TEMPERATURE SERVICE TO OFFICE OF NAVAL RESEARCH. E. E. Fletcher, A. R. Elsea, A. B. Westerman, and G. K. Manning. June 16, 1950. 21p. (NP-1725)

The investigation of the effects of W and Mo on the α-β transformation temperature range in Co−Cr alloys was continued. Work was continued on the production of satisfactory C-bearing ternary alloys for use in determining the effect of C on the α-β transformation temperature range. Early tests resulted in excessive C losses during homogenization. The heat-treating technique and apparatus were modified; as a result, several C-bearing alloys have now been homogenized with only a slight loss of C. Commercially produced alloys, Stellite 21 type, of four different analyses have been homogenized, and the C was retained quite satisfactorily. Partial melting occurred when the usual homogenizing treatment of 80 hr at 1260°C was used. Some modification of this treatment may be required for the Vitallium-type alloys and for the C-bearing ternary alloys, especially those with relatively high C contents. Fourteen creep-rupture tests at 780, 915, and 1000°C have been completed on Co−Cr alloys containing nitrogen.

2477

Langley Aeronautical Lab.
A STRUCTURAL-EFFICIENCY EVALUATION OF TITANIUM AT NORMAL AND ELEVATED TEMPERATURES. George J. Heimerl and Paul F. Barrett. Jan. 1951. 16p. (NACA-TN-2269)

A structural-efficiency evaluation of Ti including comparisons with several other materials is given for compressive loading without buckling, for column buckling, and for the buckling of long plates in compression or shear. The methods of evaluation, based on the use of stress-strain curves and structural indexes, are fully described. The comparisons indicate that the high-strength Al and Mg alloys are generally more efficient on a unit-weight basis at normal temperatures than commercially pure Ti sheet having a compressive yield stress of about 106 ksi. For short-time loading conditions at temperatures beginning somewhat above 400°F, Ti sheet is more efficient than the Al alloys. (auth)

2478

Bureau of Mines, Albany, Oregon
ZIRCONIUM PROCESS DEVELOPMENT; CONSOLIDATED REPORT NO. 1; 15 JUNE−15 NOVEMBER 1950. W. W. Stephens. [nd.] 31p. (NP-1953)

The Kroll process for production of ductile Zr is essentially a multistep batch process. It has been proposed that a consolidation of steps might be expected to increase the output of Zr metal without increasing the requirements of men and equipment. Double reduction runs are made by carrying out

a normal reduction in a new-type furnace arrangement, blowing out the by-product $MgCl_2$, adding a second charge of Mg metal, and carrying out a second reduction right on top of the Zr formed in the first. Time factors indicate that a pair of furnaces arranged for double reductions can produce anywhere from 50 to 100% more Zr than they can by the present process. No difficulty has been encountered in piping or valving the stream of chloride vapor between furnaces. Some improvements in Mg feeding will be necessary for full effectiveness. The bolted lid employed on the reduction furnace in this work offers greater stability in operation with attachments than the floating tops employed previously. On the basis of the work done so far, a pair of reactors is being prepared for extended testing in the production plant. To determine a method of attack upon the problem of semicontinuous operation a partial reduction run was made. Preliminary tests indicate the possibility of concentrating a Zr–Mg mud which is formed in reduction. This mud may be amenable to settling, rake classification, or filtering. An expanding program of tests will be made to find the most practical approach to the problem.

MINERALS AND MINERALOGY

2479

THE DISTRIBUTION OF URANIUM AND THORIUM IN THE GRANITE OF QUINTIN, BRITTANY, AND PARTICULARLY IN THE THORIFEROUS ALLANITE OF THIS GRANITE. André Demay. Compt. rend. 232, 338-40(1951) Jan. 22. (In French)

Some preliminary results of studies with counters, electroscope, and autoradiography of the heavy minerals accessory to the granite of this locality are summarized. The heavy minerals, of which allanite is particularly important being about 1/800 by weight of the granite, have 50 times the radioactivity of the granite. About 50 to 60% of the Th is found in allanite crystals the greatest dimension of which varies from 0.4 to 1 mm. The remainder of the Th and probably almost 100% of the U is contained in much smaller inclusions, the dimensions and mineralogy of which will be discussed later. (See following abstract)

2480

THE DISTRIBUTION OF URANIUM AND THORIUM IN THE GRANITE OF QUINTIN, BRITTANY, AND PARTICULARLY IN THE THORIFEROUS ALLANITE OF THIS GRANITE. André Demay. Compt. rend. 232, 639(1951) Feb. 12. (In French)

Errors appearing in the article of this title (Compt. rend. 232, 338-40(1951) Jan. 22) are corrected.

2481

A FURTHER INVESTIGATION OF THE RADIOACTIVITY OF THE ROUND LAKE AND ELZEVIR BATHOLITHS. H. A. Slack and K. Whitham. Trans Am. Geophys. Union 32, 44-8(1951) Feb.

A field γ-ray counter suitable for measuring weak radioactive sources has been designed and built. It was mounted in a truck and used to investigate the distribution of radioactivity over two batholiths in the Pre-Cambrian shield. The distribution of radioactivity had previously been investigated by determining the α-ray emission from prepared hand specimens. By recording the anticoincident counts between two rows of Geiger tubes, approximately 70% of the cosmic-ray background was eliminated, making possible more precise and rapid determination over weakly radioactive rocks. Since γ radiation was recorded, sampling errors were considerably reduced. The instrument was calibrated using artificially prepared rock bodies. Diagrams are presented for the two batholiths and for a suite of freshly exposed Pre-Cambrian rocks showing the readings obtained in this way compared with those obtained by the α-counting method. The uncertainties in interpretation of field results due to the presence of potassium in rocks are discussed. (auth)

2482

THE SEPARATION OF URANIUM; MINERAL TECHNIQUE DEVELOPED BY THE CRL. Chem. Age (London) 63, 648-50(1950) Nov. 4.

Brief mention is made of the methods of separation and determination of uranium-bearing minerals set forth in a British publication, "The Handbook of Chemical Methods for the Determination of Uranium in Minerals and Ores," issued by the Chemical Reserach Laboratory. Among the principles discussed is the method of obtaining a solution of the ore for analysis. The particular method to be used depends on how readily the ore can be decomposed.

2483

STUDIES OF URANIUM MINERALS (VII): ZEUNERITE. Judith Weiss Frondel. Am. Mineral. 36, 249-55(1951) Mar.-Apr.

X-ray study by the Weissenberg method on zeunerite from Tintic, Utah, gave a space group $P_4/nmm-D_{4h}^7$ and cell dimensions $a_0 = 7.13$ A, $c_0 = 8.83$ A, with $a_0 : c_0 = 1 : 1.238$. The unit cell contents are $Cu(UO_2)_2(AsO_4)_2 \cdot 8H_2O$. The calculated specific gravity is 3.79; the measured specific gravity of Schneeberg material is 3.64. Study of synthetic zeunerite indicated the existence of two and possibly three hydrates, one with 16 to 10 H_2O, and possibly a still lower hydrate. In this respect the synthetic material is similar to autunite and torbernite, both of which have been found in the fully hydrated form and as lower hydrates, meta I and meta II. Natural zeunerite corresponds in water content and x-ray structure to meta-autunite I and to synthetic zeunerite with $8H_2O$. Variation in water content affects both the optical and the fluorescent properties of the material. (auth)

PHYSICS

2484

Brookhaven National Lab.
PHYSICS DEPARTMENT; p.1-25 of QUARTERLY PROGRESS REPORT; JULY 1–SEPTEMBER 30, 1950. Nov. 1950. 25p. (BNL-82(p.1-25))

In most instances, the material presented is an abstract or an abridged edition of a more complete coverage of the work which is either already submitted or is about to be submitted for publication in a scientific journal or for oral presentation before a scientific society. The items have been grouped under five general headings: dynamic properties of nuclei, stationary properties of nuclei, high energy particle physics, general physics sometimes utilizing nuclear techniques, and theoretical topics. Reports on the scattering of neutrons in an iron single crystal, the mass of S^{35} from microwave spectroscopy, meson production by primary protons of the cosmic radiation, oriented overgrowth of alkali chlorides on metals, high energy neutron scattering by nuclei, etc., are included.

2485

Brookhaven National Lab.
REACTOR SCIENCE AND ENGINEERING DEPARTMENT; p.105-10 of QUARTERLY PROGRESS REPORT; JULY 1–SEPTEMBER 30, 1950. Nov. 1950. 6p. (BNL-82(p.105-10))

Reactor evaluation, radioisotope production, shielding and waste-disposal problems are discussed. Meteorological conditions relating to reactor start-up are considered. The problem of ground- and surface-water sampling is discussed.

2486

Oak Ridge National Lab.
PROPOSAL FOR PUTTING NUCLEAR DATA ON PUNCHED CARDS; MATHEMATICS PANEL. Nancy M. Dismuke, Irma S. Wachtel, and Katharine Way. Feb. 9, 1951. 20p. (ORNL-883)

A plan is proposed for coding certain nuclear properties and numerical values on McBee Keysort cards, so that all nuclei may be quickly searched for any of the coded data. Drawings of two proposed cards, one for a stable nucleus and one for a radioactive nucleus, together with a detailed explanation of the suggested code are presented. Comments and suggestions are solicited by the authors so that a recommendation can be made to the AEC for the production of sets of cards meeting as many experimental and theoretical needs as possible. (auth)

2487

Radiation Lab., Univ. of California
SUMMARY OF THE RESEARCH PROGRESS MEETING OF JULY 20, 1950. Henry P. Kramer. Oct. 23, 1950. 12p. (UCRL-860)

By means of apparatus shown schematically the stopping power for 300-Mev protons of various materials relative to Cu was measured. The stopping power of Al as measured was K = 8.7. According to W. Aron's range-energy curves, K = 8.8. This bears out the good agreement between the tables and measurement that was found throughout the work. Experiments are being carried out to determine the probability that particles heavier than He ions are boiled off from nuclei on excitation with high-energy protons. The mass of the neutral meson has been determined to be $\pi^0 = 265 \pm 6\ m_e$.

2488

Radiation Lab., Univ. of California
SUMMARY OF THE RESEARCH PROGRESS MEETING OF AUGUST 3, 1950. Henry P. Kramer. Oct. 20, 1950. 10p. (UCRL-864)

Apparatus for observing Cherenkov radiation is discussed and shown schematically. It consists of a sheet of glass inclined to the beam direction at an angle $\pi/2 + \theta$ whose aluminized rear surface reflects the Cherenkov radiation produced in it through a prism into a camera onto a film. Some information has been obtained regarding the nuclear excitation levels of Pb^{207} by observing the electron radiation from a mixture of Bi^{207} and Bi^{208} produced by deuteron bombardment of lead. It is concluded that electron radiation from Bi^{208} does not contribute to the spectrum of the mixture, and that, therefore, electron radiation from the mixture can be exclusively attributed to transitions between nuclear energy levels of Pb^{207}. Further evidence about the energy levels of Pb^{207} was obtained by analyzing the α radiation emitted by Po^{211} in decay to Pb^{207}. On the basis of an experiment by W. Panofsky on π^- absorption in H the transition matrix that specifies the final states of the nucleons and mesons from this process has been constructed.

2489

Atomic Energy Project, Univ. of California, Los Angeles
MOLECULAR WEIGHTS FROM STREAMING BIREFRINGENCE. Melvin D. Schoenberg. Jan. 15, 1951. 10p. (UCLA-105)

An empirical method for the calculation of molecular weights from the pair measurement flow birefringence–intrinsic viscosity is presented. Agreement between the theoretical and experimental results is obtained. (auth)

2490

Rochester Univ.
[ROCHESTER HIGH ENERGY PHYSICS PROGRAM; FINAL REPORT; JULY 1, 1949, TO AUGUST 31, 1950.] 1950. 12p. (NP-1920)

Cyclotron Group. A "spot grid," whose function is to sweep electrons from the space above and below the dee and so prevent ion loading of the dee has been successfully operated. Two method have been in use for proton-proton scattering measurements: (1) a coincidence counter scheme,

and (2) a magnetic deflection experiment. Development of apparatus to be used for the electrical detection of the external meson beam of the 130-in. cyclotron is indicated, and a plot of the yield of 20-Mev π^+ mesons as a function of the atomic number of the target is shown. Cloud-chamber studies are reported. The major project has been to provide sufficient shielding and collimation for the neutron beam and to synchronize cloud-chamber operation with the cyclotron. The neutron flux available near the cyclotron has been estimated by two methods: measurement of the C^{11} activity produced by the $C^{12}(n,2n)C^{11}$ reaction and by measuring the number of recoil protons obtained from a hydrogenous material using a predetermined cross section. An investigation of protons emerging from nuclei under 250-Mev proton bombardment, proton bremsstrahlung, proton-induced stars, etc., is also reported. Cosmic Ray Group. Activities of this group are reported under three projects: preparation of equipment for an exposure of emulsions near the magnetic equator in India, investigations of large meson showers, and investigation of the chemical composition, energy, spectrum, and nuclear interactions of the primary cosmic radiation. Theoretical Physics Group. Problems in high-energy physics have been considered as indicated by the following subdivisions: absorption of slow π^- mesons by nuclei; scattering of π mesons by nucleons; bremsstrahlung in proton-neutron collisions; π decay, μ decay, and β decay; negative proton annihilation; nucleon-nucleon scattering; production of π mesons; nonrelativistic limit of Dirac theory; excitation of nuclei by nucleons; energy levels of π meson in smeared Coulomb fields; and metastable isobaric states of nucleons.

2491

Duke Univ.
[TECHNICAL REPORTS 1 THROUGH 4.] Walter M. Nielsen. Jan. 9, 1951. 41p. (NP-1863)

Separate abstracts have been prepared on the following sections of this report: Cosmic-Ray Bursts in Ionization Chambers of Different Materials, Technical Report No. 1; A Cloud-Ionization Chamber for the Study of Cosmic Ray Nuclear Interactions, Technical Report No. 2; Gamma-Ray Spectrum of K^{40}, Technical Report No. 3; and Positron Search in K^{40}, Technical Report No. 4.

COSMIC RADIATION

2492

ABSORPTION OF PENETRATING SHOWER SECONDARIES. D. M. Ritson. Phil. Mag. (7) 42, 250-4(1951) Mar.

Measurements with a penetrating shower apparatus at sea level showed an apparent mean free path for absorption of the secondaries of penetrating showers of 405 ± 30 g/cm^2 for lead and 350 ± 40 g/cm^2 for iron. (auth)

2493

Duke Univ.
COSMIC-RAY BURSTS IN IONIZATION CHAMBERS OF DIFFERENT MATERIALS; TECHNICAL REPORT NO. 1 of [TECHNICAL REPORTS 1 THROUGH 4]. Harold W. Lewis. Jan. 9, 1951. 2p. (NP-1863(T.R.1))

This report has appeared as a letter to the editor in Phys. Rev. 78, 483-4(1950), an abstract of which appeared in Nuclear Science Abstracts as NSA 4-3979.

2494

Duke Univ.
A CLOUD-IONIZATION CHAMBER FOR THE STUDY OF COSMIC RAY NUCLEAR INTERACTIONS; TECHNICAL REPORT NO. 2 of [TECHNICAL REPORTS 1 THROUGH 4]. H. W. Lewis, W. W. Brown, D. O. Seevers, and E. W. Hones. Jan. 9, 1951. 19p. (NP-1863(T.R.2))

A combination cloud chamber and ionization chamber, in which the gas (argon at 51 psi saturated with isoamyl alcohol) is common to both chambers, is described. The ion chamber, a 3¾-in.-diam brass cylinder 8 in. in length, open at both ends, and having a 1/16-in. central wire, is mounted coaxially with the cloud chamber, which has a useful rectangular volume 10 in. by 10 in. by 8 in. A burst occurring in the ion chamber generates a pulse which is used to trigger the expansion mechanism. Rapid reduction of the cylinder voltage from −1800 volts to ground, after electron collection is over, prohibits any appreciable motion of positive ions, and thus permits observation of the tracks of the burst-producing particles. In preliminary tests at sea level, cosmic-ray bursts from cascade showers and from stars occurring in the wall (up to 10 prongs) and in the gas (up to 5 prongs) of the ion chamber have been observed. (auth)

2495

Duke Univ.
GAMMA-RAY SPECTRUM OF K^{40}; TECHNICAL REPORT NO. 3 of [TECHNICAL REPORTS 1 THROUGH 4]. Myron L. Good. Jan. 9, 1951. 9p. (NP-1863(T.R.3))

The γ-ray spectrum of K^{40} has been measured using a scintillation spectrometer. The crystal was a 1-in. cube of NaI(Tl). A modified Jordan and Bell pulse amplifier and an electronic differential pulse-height discriminator were employed. Amplifier gain and discriminator window width were monitored by a pulse generator, the pulse-voltage measurement being made by a standard cell potentiometer, which also served to monitor the phototube supply voltage. Using the Co^{60} upper γ ray as standard at 1.332 ± 0.001 Mev, the energies determined are: K^{40}, 1.459 ± 0.007 Mev; Zn^{65}, 1.127 ± 0.009 Mev.

2496

Duke Univ.
POSITRON SEARCH IN K^{40}; TECHNICAL REPORT NO. 4 of [TECHNICAL REPORTS 1 THROUGH 4]. Myron L. Good. Jan. 9, 1951. 6p. (NP-1863(T.R.4))

The γ ray of K^{40} is associated with K-capture because its energy is greater than the β-ray end-point energy, and its intensity is much less than that of the β rays. The γ-ray energy is greater than $2m_0c^2$. Under these conditions positron decay is to be expected. Annihilation quanta from K^{40} were therefore sought. Following a description of apparatus and experimental results it is concluded that as many as one positron per 100 γ rays may be present.

2497

THE DISINTEGRATION OF LEAD NUCLEI BY COSMIC RAYS. P. E. Hodgson. Phil. Mag. (7) 42, 82-94(1951) Jan.

Cosmic-ray stars in Pb have been investigated by means of photographic plates in close contact with Pb foil. The energy distributions of protons and α particles from Pb stars have been determined and are compared with the prediction of the evaporation theory. The mean ratio of doubly to singly charged particles is estimated, and an approximate value of the rate of star production in Pb is deduced. (auth)

2498

DISTRIBUTION OF SLOW NEUTRONS IN FREE ATMOSPHERE UP TO 100,000 FEET. Luke C. L. Yuan. Phys. Rev. 81, 175-84(1951) Jan. 15.

Two identical proportional counters filled with BF_3 of 96% B^{10} have been sent aloft to an altitude of 102,000 ft at a geomagnetic latitude of 51°46′ N by means of free balloons. One counter was shielded with 0.030 in. of Cd and the other enclosed in Sn of the same thickness for the compensation of possible effects caused by "stars" produced in the Cd shield. The difference in the counts of the two counters is due only to slow neutrons ($E \leq 0.4$ ev). The counts, pressure, and temperature were radioed down by an FM telemetering system. Up to about 20 cm Hg the counts increase exponentially with altitude according to an absorption depth $\lambda = 156$ g/cm^2, in agreement with previous measurements, and roughly with the increase of "stars" in the atmosphere. The counts of both counters as well as their difference show a maximum at high altitude, as expected theoretically. The maximum for the Cd difference counts appears at about 8.5 cm Hg and drops down sharply to about one-fourth of its maximum value at 1 cm Hg. The counter sensitivity was calibrated against a standard neutron source and the absolute number of slow neutrons absorbed per gram and second in the atmosphere is computed and compared with the number of protons produced at the same altitudes. (auth)

2499

THE ORIGIN OF COSMIC RAY STARS. J. B. Harding. Phil. Mag. (7) 42, 63-73(1951) Jan.

Estimates for the energy and momentum lost by particles which produce stars when passing through the nuclei in a photographic emulsion support the conclusions reached in a previous paper (Phil. Mag. 40, 530(1949); Nature 165, 273(1950)) that the majority of disintegrations are not produced by neutrons which are captured in a single nuclear encounter. The ratio of these two quantities, which have been obtained from the detailed statistical analysis of the various particles produced in nuclear disintegrations, suggests that nuclei are partially transparent to high-energy neutrons which at 3600 m have sufficient energy to produce a small number of stars. (auth)

2500

ON PAIR PRODUCTION BY FAST ELECTRONS. J. E. Hooper, D. T. King, and A. H. Morrish. Phil. Mag. (7) 42, 304-9(1951) Mar.

A study has been made of electron "pairs" directly produced by fast electrons in photographic emulsions. Evidence is presented to show that this process is of importance in the development of electromagnetic cascades present in the soft component of the cosmic radiation. It is found that the variation with energy of the cross section for the interaction agrees with that predicted by theory. (auth)

INSTRUMENTS

2501

Brookhaven National Lab.
PRECISION REGULATED HIGH VOLTAGE SUPPLIES. W. A. Higinbotham. Jan. 18, 1951. 5p. (AECU-1152)

Well-stabilized high-voltage power supplies are required for use with proportional and scintillation counters. The new 5651 voltage-regulator tube was studied and found to be sufficiently stable to supply the reference voltage in such applications. Several power supplies have been designed which show a drift of not more than 0.01% for a period of hours and 0.1% per day, in continuous operation. Two high-voltage supplies are described; one delivers 500 to 1500 volts and the other, 1000 to 5000, at 0 to 1 ma. 3 figures.

2502

Brookhaven National Lab.
INSTRUMENTATION AND HEALTH PHYSICS DEPARTMENT; p.26-32 of QUARTERLY PROGRESS REPORT; JULY 1-SEPTEMBER 30, 1950. Nov. 1950. 7p. (BNL-82(p.26-32))

Reports on electronics include the following: a timer for a time-of-flight mass spectrometer, pulse-height analysis, coincidence circuits, civilian defense monitoring, airborne-dust-activity measurements, counter tubes, etc. Reports on a building survey and area and personnel monitoring are included in the section dealing with health physics.

2503

COSMIC-RAY RADIOSONDE AND TELEMETERING SYSTEM. Martin A. Pomerantz. Electronics 24, 88-92 (1951) Apr.

A detailed discussion is presented of the detection of cosmic rays at high altitudes with reference to the types of equipment and procedures used in recent investigations (Phys. Rev. 75, 69(1949); ibid. 77, 830(1950)).

2504

AN ELECTRON CURRENT REGULATOR FOR MASS SPECTROMETER ION SOURCES. V. J. Caldecourt. Rev. Sci. Instruments 22, 58-9(1951) Jan. (Laboratory and shop note)

Maintaining constant power input to the filament is desirable. The electron current is then controlled after leaving the filament. A method which has certain advantages is shown. The catcher current is used to control the voltage on the first slit of the electron gun through a vacuum-tube amplifier. The circuit provides a large improvement

factor to compensate for filament current changes or effects of samples on the emission of the filament and has low output impedance, so that leakage of the insulators of the first slit can cause little trouble. Leakage of the insulators of the first slit often occurs because of formation of carbon deposits by thermal decomposition of sample vapors at the hot filament and other hot surfaces of the ion source close to the filament. The circuit is being used with a Hipple 90-deg mass-spectrometer tube. It was found that a 0.1-volt change in potential of the first slit would change the catcher current by 0.6 to 0.7 μamp. The use of a 10-megohm catcher electrode load resistor therefore provides a voltage gain of 60, and only a simple amplifier is needed to give a large improvement factor. The amplifier, which has a gain of 6 when used on a Hipple tube, gives an over-all improvement factor of about 400. This means a sample which would reduce the filament emission 40% will change the catcher current by 0.1%. The mass spectrometer in which the unit is used operates with the ion source grounded. The method should be applicable to spectrometers which operate with the ion sources at high potential if the proper precautions are taken with the insulation.

2505

GEIGER-COUNTER PULSE SIMULATOR. M. A. Pomerantz. Electronics 24, 200, 202(1951) Apr.

Brief note is made of a pulse simulator used for the testing of G-M counter coincidence circuits under conditions similar to those they would encounter under actual operation. A controllable source of artificial pulses is revealed which has been found useful in facilitating last-minute checks of balloon-borne cosmic radiosondes (Electronics 24, 88(1951) Apr.) immediately prior to release. A circuit diagram of this pulse simulator is shown.

2506

Babcock and Wilcox Co.
AN INVESTIGATION OF ELECTROMAGNETIC FLOWMETERS; TECHNICAL REPORT I. N. G. Elrod, Jr., and R. R. Fouse. June 12, 1950. 31p. (NEPA-1451; No. 5206)

The theoretical and experimental work on a-c and d-c electromagnetic flowmeters for use in metering molten metals is reported. The theory of these flowmeters is generalized to allow for short-circuiting of the flowmeter voltage by a conducting tube-wall. Experiments performed with mercury confirm the theory within 6%. A recommended flowmeter is described in detail.

2507

National Bureau of Standards
NATIONAL BUREAU OF STANDARDS REPORT OF THE OFFICE OF BASIC INSTRUMENTATION FOR THE QUARTER ENDING SEPTEMBER 30, 1950. (Report No. 2). W. A. Wildhack. Sept. 1950. 12p. (NP-1855)

Brief statements are made of objective, background, and progress on spring transducer, pneumatic instruments, nuclear resonance magnetic-field meter, improved optical microscopes, mutual inductance transducer, vacuum-tube accelerometer, evaluation of improved strain gages, absolute measurement of vibration amplitudes, dynamic instrumentation survey, piezo electric accelerometer, electron interferometer, pulsed photomultiplier, mass spectrometer, and cathode-ray oscillograph beam intensification.

2508

ON DELAYED COINCIDENCE CIRCUITS. Takeo Hayashi, Yoshihide Ishizaki, Kiyoshi Nishikawa, and Kiichi Kimura. Bull. Inst. Chem. Research Kyoto Univ. 23, 51(1950) Dec. (abstract)

Brief note is made of a time-delay circuit which employs a rectangular pulse A, of time width t_A, followed by a similar rectangular pulse B, delayed Δt, into a coincidence circuit, with the result that the output pulse height is enlarged only in the time interval when the two pulses are superimposed, the height being $t_A - \Delta t$. A sawtooth pulse is generated proportional to the superimposed input pulse and is sent into recorder circuits adjusted to operate only when the height of the pulse falls within their adjusted limits.

2509

OPERATION OF AN ELECTRON-MULTIPLIER. Sakae Simizu, Hidekuni Takegoshi, Eiko Nishimura, and Nariyoshi Ogura. Bull. Inst. Chem. Research Kyoto Univ. 23, 53(1950) Dec. (abstract)

An electron multiplier containing 13 beryllium-copper electrodes has been constructed and used to count α and γ particles. Electrons emerging from the first electrode under the action of radioactive or other ionizing particles are amplified to a measurable quantity by the ejection of secondary electrons at the successive electrode surfaces. The counting efficiency of the multiplier for γ rays was found to be about 10% of that of a G-M counter, while the α-particle counting efficiency was apparently 100%.

2510

Admiralty Research Lab., Teddington
THE RADIAC SLIDE RULE. B. W. Soole. Mar. 1950. 13p. (ARL-R1/R-251; ACSIL/ADM/50/253)

The danger to persons exposed to the nuclear radiations from the fission products deposited after an atomic explosion cannot be fully estimated from a measurement of the ionization dose rate at any particular time. This is because the intensity of ionization from fission products decreases continually, and the rate of decrease depends on the age of the fission products. Thus the total dose received by anyone is less than would be expected if allowance is not made for the decay of dose rate during the period of exposure. A slide rule is described by means of which this decay can be allowed for rapidly and accurately. By its use, all problems of radiation dosage received from decaying fission products may be rapidly solved. (auth)

2511

A SHEET SPECIMEN SCANNER FOR X-RAY DIFFRACTION. D. J. Neil. Can. J. Technol. 29, 84-6(1951) Feb.

An improved and simple design for an x-ray-diffraction scanner is described. Simultaneous-back reflection and transmission photographs at distances of 3 and 5 cm, respectively, and at any glancing angle from 0 to 90 deg

are possible. The area scanned is approximately 2 cm^2 at rates of either 2 or 4 cm^2 per hr. Useful exposures can be obtained with exposure times as low as 10 min. (auth)

ISOTOPES

2512

Brookhaven National Lab.
MASSES OF Al, Si, P AND S ISOTOPES. Henry T. Motz. Jan. 17, 1951. 5p. (AECU-1139)

Mass spectrograph data are now available for Al^{27}, Si^{28}, Si^{29}, Si^{30}, and S^{32} isotopes. Owing to relatively inaccurate Q-value determinations, these masses may be considered as isolated from isotopes having masses known to comparable accuracy which fall outside this region. Mass differences between pairs of these five masses are available from Q values corresponding to ground-state transitions. Those mass differences which have a probable error low enough to influence the mass defects are listed, and their relations are shown. The Al^{28}, P^{31}, and P^{32} mass defects are given as determined from an approximate fit of the observed mass differences with the best fit values.

2513

Radiation Lab., Univ. of California
PRODUCTION AND ISOLATION OF CARRIER-FREE RADIOISOTOPES. Warren M. Garrison and Joseph G. Hamilton. Dec. 28, 1950. 51p. (UCRL 1067)

Separation processes for the production and isolation of about 80 carrier-free radioisotopes are outlined and classified. Types of separation processes and purity considerations are discussed together with uses and sources of radioisotopes. The major fission products of half-life greater than 1 week, carrier-free radioisotopes produced in the pile by (n,γ) reaction followed by β decay and by (n,p) and (n,α) reactions, excitation functions of some cyclotron transmutation reactions, and thick target yields for various D and α energies are tabulated.

2514

INVESTIGATIONS ON THE RADIOACTIVITY OF THE ATMOSPHERE. Hubert Garrigue. Compt. rend. 232, 722-4(1951) Feb. 19. (In French)

During 1950, a total of 116 radioactivity measurements were made on the ground at altitudes of 300 and 1500 m and a total of 46 (which are listed in detail) were made in a "flying laboratory" at altitudes up to 5670 m. Radon was always detected, its concentration varying greatly, thorium (sic) was sometimes found, and on six flights a substance of 20- to 30-hr apparent half-life was detected.

ISOTOPES SEPARATION

2515

Yale Univ.
CONCENTRATION OF A^{36} AND A^{38} AND STUDY OF THE A^{36} (d,p)A^{37} REACTIONS AND THE BETA ACTIVITY OF A^{39}. A. Zucker and W. W. Watson. July 18, 1950. 16p. (NYO-505)

The concentration of A^{36} up to 95.9% by the thermal diffusion method is described. Observation of the proton groups resulting from the deuteron bombardment of this gas gives the following Q values for the $A^{36}(d,p)A^{37}$ reaction: 6.49, 5.05, 3.93, 2.95, 2.09, 1.86, 1.42, and 0.64 Mev. Comparison with the proton distribution from $A^{40}(d,p)A^{41}$ shows the importance of having well-separated isotopes for the resolution of proton groups of nearly the same energy from each isotope. The enrichment of A^{38} to 0.75% in this same gas makes measurement possible on the β's from the $A^{38}(d,p)A^{39}$ reaction. These A^{39} β particles have a half-life of 160 ± 5 sec and a maximum energy of about 2.1 Mev. (auth)

2516

Oak Ridge National Lab.
RECOIL REACTIONS IN THE CHAIN REACTING PILE; I. PRODUCTION OF HIGH SPECIFIC ACTIVITY BROMINE-82 BY A SZILARD-CHALMERS REACTION WITH SOLID $KBrO_3$. G. E. Boyd, J. W. Cobble, and Sol Wexler. Jan. 23, 1951. 28p. (ORNL-815)

Enriched 35.9-hr Br^{82} was produced by means of a Szilard-Chalmers reaction with crystalline $KBrO_3$ in the Oak Ridge pile. Specific activities as high as 820 rd/mg, corresponding to a 21,000-fold enrichment, were obtained. Quantitative measurements of the variation of the specific activity with irradiation time and neutron-source intensity were found to agree with an elementary theory based on the activation equation and the assumption that the rate of the nonactivating radiation decomposition of $KBrO_3$ was proportional to the mass irradiated and to the power. The prediction that the specific activity will be independent of the pile power and will decrease steadily with increasing irradiation time was confirmed, as was the predicted inverse dependence of the enrichment on power and time. The retention of radiobromine as bromate was found to increase with time and to be independent of power. (auth)

2517

IONIC MIGRATION IN A COUNTER-CURRENT AS A BASIS FOR ELECTROCHEMICAL EXCHANGE PROCESS; trans. from Z. Naturforsch. 4a, 28-37(1949) Apr. Hans Martin. 1949. 22p. (NP-2242)

An abstract from the original article has appeared in Nuclear Science Abstracts as NSA 4-739.

2518

A METHOD OF ISOTOPIC SEPARATION BY (n,γ) RECOIL. L. B. Magnusson. Phys. Rev. 81, 285-6(1951) Jan. 15. (Letter to the editor)

A new method is proposed for utilizing the recoil energy from γ emission for isotopic separation. If targets in the form of very thin films are bombarded with thermal neutrons, an appreciable percentage of the (n,γ) product atoms have sufficient recoil energy from the γ emission to leave the film. A successful preliminary trial of this method has been performed by the neutron bombardment of Au^{197} to produce Au^{198}.

2519

SEPARATION OF RADIOCHLORINE BY THE SZILARD-CHALMERS REACTION. John Keene Major and Pierre Süe. Compt. rend. 232, 52-4(1951) Jan. 3. (In French)

The effectiveness of separation of radiochlorine (38-min Cl^{38} serving as a tracer for the 10^6-yr Cl^{36}) by the Szilard-Chalmers reaction of C_2Cl_6, solid and in benzene solution, and CCl_4 irradiated with neutrons in the Chatillon pile has been determined. The effectiveness is greater for the liquid state than for the solid, does not depend on the concentration of the solution, and diminishes exponentially with duration of irradiation.

MASS SPECTROGRAPHY

2520

Kellex Corp.
SOLID SAMPLE ANALYSIS WITH THE MASS SPECTROMETER. Oct. 24, 1949. Decl. Jan. 12, 1951. 12p. (AECD-3040; KLX-512-N)

The Consolidated-Nier Isotope-Ratio mass spectrometer has been modified to permit an experimental study of its application to the continuous analysis of solid samples. These modifications fall into three categories: (1) A method of introducing solid samples, either continuously or in a semicontinuous manner, has been designed and studied experimentally. This system permits sample introduction without loss of vacuum in the mass spectrometer. Several proposed applications are outlined. (2) Five ion sources (designed or proposed) for application to the ionization of solids are discussed. (3) Auxiliary modifications, to extend the use of the mass spectrometer to the high mass range, are listed. (auth)

2521

A 180° MASS SPECTROMETER FOR BIOCHEMICAL RESEARCH. Hans von Ubisch. Arkiv Fysik 2, No. 6, 509-16(1951).

A 180-deg mass spectrometer intended primarily for isotopic analysis of light elements is described. Photographs and a block diagram of the general assembly are shown. Schematic diagrams are presented of the emission regulator, high-vacuum safety relay, and voltage-divider circuits. The spectrometer has been used for work on deuterium and for relative isotopic abundance measurements of carbon in biochemical and mineralogic samples. The reproducibility of these measurements has been within 0.1 to 0.2%.

2522

MASS SPECTROSCOPY. PART I. Fernando del Valle Rodriguez, Antonio Bourgeal Ustariz, and Ernesto Orellana Silva. Rev. de cienc. aplicada (Madrid) 4, 481-94(1950) Nov.-Dec. (In Spanish)

In this first part of a general outline of mass spectroscopy, a short historical introduction is followed by a description of the parabolic and single-focusing methods, and of instruments of Aston, Nier, Bainbridge, Smythe, and others.

2523

QUALITATIVE ANALYSIS FROM MASS SPECTRA. S. M. Rock. Anal. Chem. 23, 261-8(1951) Feb.

Chemical analysis from mass-spectrometric data may be either qualitative or quantitative. The latter has been extensively covered in the literature, but the methods used in the former have not been systematically presented. This paper presents several aids to qualitative analysis and outlines and illustrates various basic procedures, e.g., check of mass intervals to identify fragments and elements; use of peak-free regions to establish absence of fragments; comparison of peaks with those predicted from normal stable-isotope ratios; recognition of characteristic half-mass and metastable transition groups; and use of mass-spectral compilations such as those available from A.P.I. Project 44 (Natl. Bur. Standards "Catalog of Mass Spectral Data"). A table of isotope contributions of hydrocarbons through C_7 is given. Peaks are roughly classified by magnitude and charted against mass in a summary of the spectra of 279 compounds. One of the most valuable features of the mass spectrum of a mixture is that all materials present register; the method can be relied on for both positive and negative information, and unexpected components do not escape detection. (auth)

2524

REFERENCE STANDARD FOR MASS SPECTROMETRIC ANALYSIS OF NITROGEN. Sidney Soloway. Anal. Chem. 23, 386(1951) Feb. (Note)

In the course of routine mass-spectrometric analysis of N_2 samples variously enriched with N^{15}, it was necessary to have available at all times a sample of standard N_2 both for reference purposes and for sweeping after the analysis of highly enriched samples. Desirable features of such a standard are: (1) constancy of isotopic composition, (2) ease of preparation, and (3) freedom from O_2—it has been found that O_2 disturbs the emission characteristics of W filaments. Samples of N_2 meeting these requirements have been prepared by the exposure of room air to Fieser's solution (J. Am. Chem. Soc. 46, 2639(1924)), which readily absorbs oxygen. A tabular comparison of composition of samples of N_2 prepared by various means is included.

MEASURING INSTRUMENTS AND TECHNIQUES

2525

Kellex Corp.
SOLID DIELECTRIC IONIZATION CHAMBER. Oct. 24, 1949. Decl. Jan. 26, 1951. 9p. (AECD-3049; KLX-513-N)

The properties of a very thin solid dielectric chamber have been investigated. The construction of the thin film counter is described, together with experimental results obtained. This type of counter may be useful in radiation discrimination, such as in the detection of α particles in the presence of β particles and γ radiation. (auth)

2526

Kellex Corp.
LIQUID COUNTING SAMPLE CONTAINER. Oct. 24, 1949. Decl. Jan. 26, 1951. 5p. (AECD-3053; KLX-514-N)

A sample container has been constructed that enables the determination of the activity of a radioactive liquid sample continuously flowing through the container. The construction of the container provides for the use of conventional end-window G-M tubes in conjunction with it. 4 figures. (auth)

2527

Brookhaven National Lab.
DESIGN OF PERMANENT MAGNETS FOR CLOUD-CHAMBER WORK. R. P. Shutt and W. L. Whittemore. Aug. 21, 1950. 13p. (AECU-1076)

For the investigation of radiations of high energies a magnetic field can be placed between two cloud chambers. For a given flux of radiation to be observed, the air gap of the magnet in this arrangement can be made much smaller than when a cloud chamber is mounted between the pole pieces of a magnet. For small gap lengths, a permanent magnet is capable of producing a strong magnetic field. In order to assure most efficient distribution of the magnetic alloy used, model experiments were performed. A calculation shows that, if the variables are chosen appropriately, a single constant can be adjusted so that all the experimental results can be fitted to a universal function within a few per cent. By means of a coordinate transformation of the universal function the field intensities or determined optimum constructions of a large variety of permanent magnets can be predicted. Reasonable accuracy can be expected as long as the ratio of gap length to linear dimension of the pole faces is less than ¼. The method has been applied to the construction of a large permanent magnet to be used for a study of the anomalous scattering of cosmic-ray mesons. (auth)

2528

Wisconsin Univ.
WINDOW CORRECTION CURVES AND THE SHAPE OF BETA SPECTRA. D. Saxon. [nd.] 4p. (AECU-1128)

In a recent letter on the beta spectrum of Th^{233}, Bunker et al. (Phys. Rev. 80, 468(1950)) conclude that their observed deficiency of low-energy electrons cannot be due to source or counter-window effects. The possibility of low-energy defocussing in the spectrometer is suggested instead. It is the writer's opinion that most, if not all, of the observed deficiency is due to the counter window alone.

2529

Brookhaven National Lab.
OPERATION OF A DIFFUSION CLOUD CHAMBER WITH HYDROGEN AT PRESSURES UP TO 15 ATMOSPHERES. D. H. Miller, E. C. Fowler, and R. P. Shutt. Jan. 25, 1951. 5p. (AECU-1164)

Performance of a diffusion cloud chamber was quite sensitive to changes in the temperature distribution along the walls induced by placing various metal collars around the chamber. To obtain better control over this temperature distribution and to make the investigation of higher pressures possible, a metal chamber for use up to 15 atm has been constructed, and heating wires have been soldered to its stainless-steel side walls. In order to control the temperature of the vapor source electrically, methyl alcohol is carried in three concentric Cu troughs connected thermally to the heated Al top plate. Wide variations of the top temperature and side gradient are thus possible. Optimum conditions for good operation with several gases and pressures have been investigated. When operated with 12 atm of H_2, the chamber would continuously record ionizing radiation of 2 to 3 times sea-level cosmic-ray intensity. There is no limitation in the chamber's ability to record bursts of radiation if an electric sweeping field is applied during the intervals.

2530

Brookhaven National Lab.
A THEORY OF DIFFUSION CLOUD CHAMBERS. R. P. Shutt. Jan. 25, 1951. 24p. (AECU-1166)

An attempt is made to understand quantitatively the effects of a given gas, gas pressure, vapor, ionization density, and temperature distribution on the operation of diffusion chambers. An integral equation is set up which takes into account diffusion of the vapor through the gas, removal of vapor by condensation, drop growth, and the motion of the drops due to gravity. Temperature distributions necessary to produce tracks through a given depth of a chamber are calculated, applying to a wide variety of different conditions. For example, the most linear temperature gradient for operation with methanol and air at 1 atm or H_2 at 10 atm exposed to sea-level cosmic radiation amounts to 3.6°C/cm while for air at 3 atm or H_2 at 30 atm a gradient of 6.3°C/cm would be required. Because of the formation of uncharged drops at higher operating temperatures and because of the onset of semistable convection currents in the light gases, operation is expected to become difficult with air at a pressure > 3 atm or H_2 at a pressure > 30 atm, or with ionization densities > 4 times sea-level cosmic radiation at 1 atm of air. (auth)

2531

Argonne National Lab.
PROGRESS REPORT; BACKGROUND ANALYTICAL GROUP; p.123-34 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. W. H. Johnston. July 1950. 12p. (ANL-4488(p.123-34))

The construction and installation of a Libby screen-wall counter, with anticoincidence and shield, for low-level β counting is described. In addition, a method is outlined for the accurate determination of small amounts of radon in human breath, which consists of the adsorption of radon on charcoal, the de-adsorption into an argon-methane gas mixture at 200 to 300°C, the introduction of this gas into a special gas counter, and the counting of α particles in the proportional region. The standardization is accomplished with a 10^{-10}-c radon generator, and each gas mixture in the counter is checked with a Pu "gun" mounted on the end of the counter. This gun may be fired into the counter or cut off for counting a sample. 8 figures.

2532

Health and Safety Div., NYO, AEC
POCKET DOSIMETER SURVEY METER. Hanson Blatz and Carl B. Braestrup. Oct. 27, 1950. 5p. (NYO-1530)

A unit has been designed to widen the scope of use of the standard pocket dosimeter by enabling its use for surveying

without interfering with its normal use. The unit consists of an auxiliary ionization chamber and static charging device.

2533

Health and Safety Div., NYO, AEC
AN INEXPENSIVE, WIDE RANGE GAMMA RAY GEIGER SURVEY METER. H. D. LeVine and H. J. DiGiovanni. Jan. 4, 1951. 72p. (NYO-1538)

Detailed information is given on the theory, design, parts specifications, and assembly data for a new radiation detector for measurement of ionizing radiations. The instrument, originally designed for civil defense use, can be modified to meet the specifications of the Federal Civil Defense Administration, "Civil Defense Radiological Monitoring Instruments Specifications," issued Dec. 6, 1950. The instrument is energy independent for γ radiation from 60 kev to beyond 1 Mev and can be calibrated directly for any operating range up to 500 r/hr. The entire Geiger integrator-detector circuit consists of a Geiger tube, a microammeter, several resistive elements, and a novel high-voltage supply which is energized by two 1½-volt flashlight cells. The instrument is housed in a molded waterproof plastic case, having high shock and impact resistance. In its present form, the instrument can be mass-produced at low cost. (auth)

2534

Oak Ridge National Lab.
A SWEEP TYPE DIFFERENTIAL AND INTEGRAL DISCRIMINATOR. Edward Fairstein. Feb. 12, 1951. 18p. (ORNL-893)

A circuit is described which can be used for obtaining the pulse-height distributions from scintillation counters, proportional counters, parallel-plate counters, and other voltage-pulse sources. Differential or integral curves can be plotted automatically by the attachment of an electronic recorder or can be obtained manually with the use of the built-in rate meter or an external scaler. The counting-rate loss is approximately 1%/100,000 cpm. The over-all drift in pulse-height setting, slit-width, and counting rate zero is less than 1%/24 hr. It will operate from any positive output amplifier whose rise time is 0.1 μsec or greater, and whose output is limited to 100 volts. (auth)

2535

Oak Ridge National Lab.
A COUNT-RATE METHOD OF MEASURING FAST NEUTRON TISSUE DOSE. G. S. Hurst and R. H. Ritchie. Jan. 30, 1951. 27p. (ORNL-930)

A special proportional counter has been designed, the response of which is such that the number of counts produced is approximately proportional to dose, when the neutron energy is between 0.2 and 10 Mev. The response has been tested experimentally with monoergic neutrons of various energies between 365 kev and 5.2 Mev and at 14 Mev, and is in good agreement with the dose curve.

2536

Atomic Energy Project, Univ. of California, Los Angeles
SPECTRAL ENERGY DISTRIBUTION IN X-RAY BEAM AS A FUNCTION OF WAVELENGTH. M. A. Greenfield, R. D. Specht, P. M. Kratz, and Katherine Hand. Jan. 29, 1951. 22p. (UCLA-107; 93-107B)

A method is described for obtaining the distribution of energy in an x-ray beam as a function of wavelength. The method consists in obtaining filtration data with suitable filter material, and analyzing this data in terms of Laplace transforms. The desired distribution of energy is obtained in terms of a sum of inverse Laplace transforms. (auth)

2537

Radiation Lab., Univ. of California
SCINTILLATION COUNTERS FOR THE MEASUREMENT OF RADIOACTIVE SAMPLES. H. O. Anger. Aug. 30, 1950. 20p. (UCRL-886)

The great advantage of scintillation counting is that it makes possible the detection of γ radiation with greater efficiency than is possible with Geiger counters. This opens the possibility of counting γ rays from some biological tracer samples instead of β particles as previously. Samples containing Fe^{59} and Co^{60} are examples. Counting the γ rays from these isotopes rather than the soft β eliminates the necessity for involved chemical and electroplating techniques in preparing the sample for counting. The activity of the samples in most cases can be measured merely by placing them in glass vials without any other preparation and then placing the vials in the counter. The principles of scintillation counting and the relative efficiencies of scintillation and G-M counters are discussed, and the vial-sample counter, the circuit details, and a directional in vivo counter are described. 7 figures.

2538

BETA SPECTROGRAPHS WITH ELECTRONIC LENSES. (GENERAL THEORY OF PRINCIPAL TYPES; A NEW INSTRUMENT.) PART I. Pierre Grivet. J. phys. radium 11, 582-95(1950) Nov. (In French)

An optical theory of β spectrographs is presented, giving the resolving power, luminosity, current consumption, etc., for both point and finite sources as functions of coil dimensions, current intensity, and spherical and chromatic aberration of the lenses; the coma is considered as a secondary factor only. The theory is a third-order approximation, and its precision decreases notably when the apertures exceed 25 deg; however, an evaluation of the error can be reached through a general comparison of calculated values with the experiment and with the classical theories of du Mond and Persico concerning a β spectrograph with a uniform field; in this manner the theory can be used for a description of facts up to a 40-deg aperture. It is especially well adapted to quantitative applications in the case of short coils, where the apertures used are always small. It also provides a quantitative explanation of two particular cases of focalization discovered by Siegbahn. Although the latter's setup remains more convenient than the variant recently proposed by Bothe, the theory described here suggests an improvement in Siegbahn's instrument by

introducing a single supplementary diaphragm. References will be given in Part II. (auth)

2539

CERENKOV RADIATION COUNTER FOR FAST ELECTRONS. John Marshall. Phys. Rev. 81, 275-6(1951) Jan. 15. (Letter to the editor)

A description is given of an arrangement by which fast electrons, produced by the 48-Mev bremsstrahlung of a betatron, have been counted from the Cherenkov radiation they produce in a radiator. Electrons from a betatron beam enter a shaped radiator, made of lucite or Plexiglass where the Cherenkov radiation is focused into a cylindrical reflector and thence to a point on the axis of the system. A photomultiplier is placed at this focal point to count the incident particles.

2540

Department of Mines and Technical Surveys, Mines Branch, Ottawa
A CIRCULAR SLIDE RULE FOR HIGH-PRESSURE IONIZATION CHAMBER CALCULATIONS. P. Normand. Sept. 25, 1950. 16p. (NP-1940; TR-58/50).

The charge-time method for measuring γ radiation with the high-pressure ionization chamber is very efficient for rapid screening of ore samples where it is possible to measure a great number in the least possible time or where the radioactive content of the sample is low, and is more accurate than the deflection method. Solving the following equation is necessary:

$$\text{Per cent } U_3O_8 \text{ equiv.} = \frac{\text{Th} \times \left(\frac{1}{T_a} - \frac{1}{T_b}\right) \times 10^7}{M \times S}$$

where T_a is the time taken by a sample to produce a full-scale deflection of the needle, T_b is the time taken by the background to produce the same full-scale deflection, Th is a correction factor based on the nature of the sample, M is the mass of the sample expressed in grams, and S is the sensitivity characteristic of the sample's position and of the apparatus response to a known standard. A Wheatstone-bridge circuit for solving this equation has been designed but not built, a slide-rule method being straightforward, rapid, and accurate. Complete details of construction of the required nomograms are given.

2541

A DIRECTIONAL SCINTILLATION COUNTER FOR CLINICAL MEASUREMENTS. E. H. Belcher and H. D. Evans. J. Sci. Instruments 28, 71-5(1951) Mar.

A scintillation counter designed for clinical measurements is described. The instrument incorporates a liquid-N_2-cooled photomultiplier and a Tl-activated KI crystal separated from the photomultiplier by a Perspex light guide. Details are given of the absolute counting rates obtainable with five radioisotopes commonly used in clinical work and also of the directional properties of the instrument. The counting efficiency for the γ radiation from I^{131}, expressed as counts/quantum incident on the crystal, is 31.6%; from Br^{82}, 42.6%; from Co^{60}, 44.5%; and from Na^{24}, 60.1%.

2542

ELECTROMECHANICAL REGISTERS AS USED IN RADIOACTIVE COUNTING SYSTEMS. A. E. Bennett. Electronic Eng. 23, 81-5(1951) Mar.

The use of electromechanical registers (counters) in electronic scaling units is discussed, and the requirements which an ideal register must fulfill are outlined. Development work has been undertaken, three designs being described in detail. An outline is given of probable future developments. (auth)

2543

ELECTRON ENERGY STUDIES WITH THE ANTHRACENE SCINTILLATION COUNTER. J. I. Hopkins. Rev. Sci. Instruments 22, 29-33(1951) Jan.

Using a β-ray lens spectrometer to supply electrons of a given energy, a study of the response of an anthracene scintillation counter to monoenergetic electrons has been made. It has been found that pulse height varies linearly with energy from 125 to 3200 kev, but below 125 kev the pulse height varies less rapidly with energy. The differential counting-rate distribution for given energy settings of the lens spectrometer was found to follow a Gaussian distribution, and on the average 3.3 kev is required to produce one effective photoelectron at the cathode. When Morton's correction (RCA Rev. 10, No. 4(1949) Dec.) for dynode losses is applied, it is found to require 2.5 kev for the production of one photoelectron at the cathode or that 400 electrons enter the multiplier per Mev of incident electron energy. This is in agreement with the 420 electrons per Mev obtained by direct measurement. Assuming a 10% photoelectric efficiency at the photosensitive surface, it appears that the efficiency of anthracene for the conversion of incident electron energy into photon energy is of the order of 1 to 2%. (auth)

2544

THE ELIMINATION OF THE END EFFECTS IN COUNTERS. A. L. Cockroft and S. C. Curran. Rev. Sci. Instruments 22, 37-42(1951) Jan.

The operation of cylindrical proportional and Geiger counters near the ends of the wire has been examined closely by means of thin sheets of soft, homogeneous x radiation. It is found that small field-adjusting tubes, fitted over the usual grounded guard tubes (where these are required) and maintained at the potential appropriate to their diameter, reduce the end effects to negligible proportions. The computed field distribution is thus confirmed experimentally. Both theory and practice show that the concentric field-adjusting and guard tubes need not be longer than a radius of the counter. The method can be used in designing counters of very short operating length. In practice the technique is simple and it can be applied to the construction of ionization chambers (pulse or steady-current type), proportional counters with constant gas gain along the whole wire, and

Geiger counters. It ensures in each case a precisely defined counting volume. (auth)

2545

A LABORATORY EXERCISE IN NUCLEAR EMULSION TECHNIQUE. R. A. Peck, Jr. Am. J. Phys. 19, 48-52 (1951) Jan.

A laboratory exercise is described, adaptable to any student level from the sophomore to the first-year graduate. The prime objective is student observation of emulsion tracks, and the unique pedagogical advantages of this recording medium are considered. Details of procedure and analysis of data are discussed. (auth)

2546

A NOTE ON THE SUCCESSIVE PEAKS OF SPURIOUS COUNTS IN G-M TUBES. James E. Kupperian, Jr., Paul C. Murray, and H. Feeny. Rev. Sci. Instruments 22, 60-1 (1951) Jan. (Laboratory and shop note)

Methods employed in these investigations consisted in measuring the number of coincidences between a count and a delayed count, as a function of the delay time. Delay time was obtained by means of a multistage delay line. In order to simplify the interpretation of the results the duty cycle of each stage was made less than the recovery time of the counter. This feature is particularly suited to the detection of multiple coincidence peaks. The counters were filled with an argon-alcohol mixture and had either Cu or aquadag-coated cathodes of 3.5-cm diameter. Anode wire sizes varied from 2 to 8 mils. In some cases small percentages of O_2 were admitted to investigate the effects of negative ions on the coincidence peaks. A set of curves for a counter having an 8-mil anode wire and an aquadag-coated cathode is shown and discussed.

2547

ON SOME PROPERTIES OF 2π-TYPE COUNTER; (II). Yoshiaki Uemura, Yoshio Saji, and Sakae Shimizu. Bull. Inst. Chem. Research Kyoto Univ. 23, 56-7(1950) Dec. (abstract)

The natural counts of a 2π-type counter are shown to be approximately proportional to the length of the center wire of the counter.

2548

Naval Research Lab.
ORGANIC SCINTILLATORS. S. H. Liebson. Aug. 21, 1950. 21p. (NRL-3723)

Processes involved in the fluorescence of organic compounds under γ-ray excitation have not yielded to analysis owing to the relative complexity of the phenomena and the difficulty of measurement. Two different methods have been developed to measure the decay times of the fluors. One technique measures the decay of light caused by γ-ray excitation, based on an interference between the signal from a photomultiplier and its out-of-phase reflection from a shorted cable. Another technique employs modulated ultraviolet light and measures the phase shift of the fluorescent light caused by the mean lifetime of the excited states. Other information is obtained from temperature studies of the variation of light output for different crystals. Insufficient information exists for a complete explanation of the scintillation processes. (auth)

2549

Atomic Energy Research Establishment
RECENT PROGRESS IN THE DEVELOPMENT OF FIELD EQUIPMENT FOR PROSPECTING FOR RADIOACTIVE ORES. E. Franklin. Sept. 1950. 25p. (AERE-EL/R-396)

Developments made at AERE during the year 1949 on field prospecting instruments include the following: (1) A portable γ-ray ratemeter was designed to be cheap, light, and robust and is intended for commercial sale to the private psospector for radioactive ores; weight is about 6½ lb; indications are by both meter and headphones; battery life is 2000 hr. (2) Various improvements and attachments to the existing geologists' portable γ-ray ratemeter (type 1011), include a β-ray-sensitive probe unit, a special attachment for β-ray assay work in the field, and a portable hand winch and probe unit suitable for γ-ray logging of narrow drill holes to depths of about 1400 ft. This limit is set by the size of cable drum, chosen for portability. The cable and probe themselves could be used up to depths of 3000 to 4000 ft. (3) The development is still in progress of a light-weight comprehensive portable β- and γ-ray ratemeter, making use of recently developed low-voltage G-M tubes and minature low-current stabilizing values. This will be a light-weight version of the ratemeter now in use by the Geological Survey (type 1011) with various improvements, such as extension of the γ-ray intensity range, etc.

2550

Princeton Univ.
RESEARCH ON CRYSTAL DETECTORS OF IONIZING RADIATION; FINAL PROGRESS REPORT; 1 JUNE 1949 - 31 AUGUST 1950. Aug. 1950. 51p. (NP-1733)

New scintillation-counter techniques were developed for studying γ rays and electrons at high energies. The Compton effect at 100 Mev was studied by means of these new techniques. As a result of these studies the Klein-Nishina formula at 100 Mev was verified within an accuracy of ±10%. Large transstilbene crystals were grown. Two new organic scintillators were discovered, of which one (terphenyl) has subsequently become the basis of liquid-scintillation-counter work. A γ-ray spectrometer has been developed which easily resolves the Co^{60} γ lines at 1.17 and 1.33 Mev. NaI(Tl) shows proportionality of pulse size with energy of the particle, both for α particles and electrons. α- and β-particle pulses were compared on an equal-energy basis. CsI crystals were grown and examined with regard to scintillation-counting properties. A new method of measuring γ-ray energies and intensities has been developed. This method is based on examination of "sharp-line" pulse distributions observed in the single-crystal scintillations of NaI(Tl). These sharp lines are due to the electrons produced by the photoelectric and pair-production processes and also by multiple Compton events. Decay constants for NaI(Tl) at various temperatures were measured. It was established that at least 50% of the

light produced in a scintillation emerges from a model crystal. Studies were made of preservation of NaI(Tl) samples by lucite-molding procedures. Pair-production pulses were observed in NaI(Tl) and lead to accurate γ-ray-energy determinations at high energy. A new γ-ray line in Ga^{66} was discovered. Ghosts may appear in the single-crystal spectrum; impurities may be detected with high sensitivity; very weak sources (K^{40}) may be studied. A method was developed of investigating pulse distributions by their photographs on an oscilloscope screen. This technique is equivalent to that of employing a multichannel discriminator. It is excellent for weak γ sources and may have practical applications. An attempt was made to detect pair lines without the presence of other lines by using three crystals in coincidence. The method was partially successful but could not be demonstrated conclusively before termination of the contract research. Observations were made of pulse distribution in CsI(Tl), $CaWO_4$, LiI(Tl), and other materials. (auth)

2551

A SIMPLE LABORATORY SETUP FOR RAPID MEASUREMENT OF β-RAY DOSAGES ABOVE 1 REP/SEC. J. S. Krohmer and William A. McCarthy. Science 113, 360-1 (1951) Mar. 30. (Technical paper)

Apparatus has been assembled for the purpose of obtaining absolute dosage measurements on high flux β-ray applicators of the type used in superficial radiation therapy. This measuring group consists of an extrapolation ionization chamber similar to that devised by Failla (Radiology 29, 202(1937)), a micro-microammeter, a regulated power supply, a switching device, and a recording potentiometer.

2552

SPHERICAL ABERRATION OF A DOUBLE FOCUSING BETA RAY SPECTROMETER. N. F. Verster. Physica 16, 815-16(1950) Oct.

A mathematical derivation is presented of the magnetic field shape for conditions of minimum aberration in a double-focusing β-ray spectrometer.

2553

THEORY OF THE DOUBLE-LENS β SPECTROMETER. W. Bothe. Sitzber. heidelberg. Akad. Wiss., Math. naturw. Klasse, 191-201(1950) July. (In German)

The author discusses properties of a β spectrometer in which the spherical aberration is avoided by the use of two magnetic lenses separated by a diaphragm with a ring-shaped slit. The principle of the arrangement has been briefly explained in Naturwissenschaften 37, 41(1950), (see NSA, abstract 4-2742).

2554

THICKNESS GAGING BY RADIATION ABSORPTION METHODS. C. W. Clapp and S. Bernstein. Gen. Elec. Rev. 53, 39-42(1950) Nov.

A discussion is presented of the methods of applying x rays, γ rays, and β rays to the measurement of thickness. Examination is made of sensitivity, desirability, and limits of each type of radiation gauge, as well as the consideration of safety requirements.

2555

TISSUE SURFACE MEASUREMENTS AS A METHOD OF STUDYING IN VIVO THE CONCENTRATION OF BETA RAY ISOTOPES. THEORETICAL AND EXPERIMENTAL ANALYSIS WITH RADIOACTIVE PHOSPHORUS. Enrique Strajman. Univ. Calif. (Berkeley) Pubs. Physiol. 8, No. 21, 333-76(1951).

End-window G-M counters shielded and separated from tissues by a diaphragm with a central aperture were chosen as the detecting instrument for the experimental and theoretical analysis of tissue surface measurements. A description and analysis are given of the components of the counter geometry and the effect they have in limiting the geometrical efficiency of the emitting point located within the tissue detectable volume. Experimental data obtained in testing formulas for geometrical efficiency indicate that the absolute counting efficiency may decrease from the center to the periphery of an end-window counter. For estimating the absorption of β particles within the solid angle of the emitting point, the geometrical mass per cm^2 was used. Experiments were performed to measure the transmission through various thicknesses of polystyrene absorbers of β particles emitted from different locations. A standard absorption curve for P^{32} was obtained under conditions in which the scattering was reduced to a minimum. The effect of scattering on the number of β particles detected from point sources was analyzed by artificially dividing the tissue in the following segments: within the solid angle, back of the emitting point, and laterally between these two segments. The backscattering and lateral scattering of β particles emitted from central and lateral sources, as well as their relation to the geometrical efficiency and transmission through polystyrene absorbers, were studied. An analysis was made of factors influencing the counting efficiency of the detectable volume. An experimental estimate of relative counting efficiency is made for layers within the detectable volume by using the isotope either in solution or imbedded in a plastic. Biological factors influencing the counting efficiency of the tissue detectable volume are pointed out. Several formulas are given for calculating the concentration of the isotopes in tissues or for estimating ratios between different tissues for the various types of histological geometry. Various types of standards that are practical for comparison with tissue surface measurements are described. The histological geometry present in liver and tumor measurements in mice is analyzed. Experimental data on the absorption and contribution of β particles of P^{32} by the skin and subcutaneous tissues, abdominal muscles, liver, and tumors were obtained. A comparison of the tissue surface technique with the incineration and dried-tissue methods was made. 27 references.

MESONS

2556

Radiation Lab., Univ. of California
DETECTION OF POSITIVE π MESONS BY π^+ DECAY.

M. Jakobson, A. Schulz, and J. Steinberger. Dec. 21, 1950. 15p. (UCRL-1061)

A method of meson detection similar to that of Rasetti (Phys. Rev. 60, 198(1941)), Alvarez (Phys. Rev. 77, 752 (1950)), and Steinberger-Bishop (Phys. Rev. 78, 494(1950)), has been developed using the π^+ decay for identification. The pulses caused by a π^+ meson passing through one transtilbene crystal, and stopping in a second, open a gate of width 0.08 μsec which is delayed 0.025 μsec. If the μ^+ pulse arising from the decay of the stopped π^+ appears during the time the gate is open, the meson is counted. The amplifiers and coincidence circuits are of a distributed type. The gate generator is a nonsymmetrical cathode coupled multivibrator using miniature tubes. A measurement of the mean life of the π^+ meson has been made by varying the gate delay, and a value of $(2.54 \pm 0.11) \times 10^{-8}$ sec has been obtained. (auth)

2557

ON THE INTERACTION OF VECTOR MESONS WITH NUCLEONS. Suraj N. Gupta. Proc. Cambridge Phil. Soc. 46, 649-50(1950) Oct.

An elementary derivation is given for the results of Harish-Chandra (Proc. Roy. Soc. (London) 186 A, 502(1946)), who has recently proposed a new mathematical method of describing vector mesons.

2558

PHOTO-PRODUCTION OF NEUTRAL MESONS IN NUCLEAR ELECTRIC FIELDS AND THE MEAN LIFE OF THE NEUTRAL MESON. H. Primakoff. Phys. Rev. 81, 899(1951) Mar. 1. (Letter to the editor)

The effective interaction between the π^0 wave field and the electromagnetic wave field is used in the calculation of the probability of π^0 production in the collision of a photon with an external, approximately static electric field. Calculations made on the mean life of the π^0 show, as very rough limits, 5×10^{-14} sec$>\tau>5 \times 10^{-16}$ sec.

2559

Purdue Univ.
THE PRODUCTION OF A CHARGED MESON BY A NUCLEON; TECHNICAL REPORT NO. IV; SYNCHROTRON PROJECT. Ellis Strick. June 15, 1950. 23p. (NP-1678)

The problem of the evaluation of the cross section for the production of a charged scalar meson by a nucleon-nucleon collision was originally formulated by Nordheim and Nordheim (Phys. Rev. 54, 254(1938)) in terms of a perturbation treatment. Wang (Z. Physik 115, 431(1940)) applied the impact-parameter method to the problem and obtained a cross section which varied with the inverse first power of the incident-nucleon energy as compared with the inverse square dependence obtained by Nordheim and Nordheim. In the present paper it will be shown that the two treatments can be brought into agreement by making a more systematic account of the approximations that were previously made. Then it will be seen that the third term of a series of terms which was previously neglected gives an inverse first-power energy dependence and thus brings the perturbation treatment into agreement with the impact-parameter treatment. A rather simple extension to include the cross section for the production of a charged pseudoscalar meson in a nucleon-nucleon collision is made.

2560

PRODUCTION OF MESONS BY PHOTONS ON NUCLEI. Melvin Lax and Herman Feshbach. Phys. Rev. 81, 189-96 (1951) Jan. 15.

The total cross section, energy spectrum, and angular distribution of mesons produced by photons incident on a target nucleus have been expressed in terms of the nucleon-momentum distribution within the nucleus. The theory used here is valid for photon energies greater than approximately 1.2 times threshold, and for all but the lightest nuclei. These results have been applied to C employing Goldberger and Chew's momentum distribution for the protons in C. Excellent agreement is obtained for the meson energy spectrum at 90 deg and the decrease in efficiency of meson production compared to free protons as targets. The change in efficiency with photon energy, and the meson spectrum at various angles can be used to determine the internal nucleon-momentum distribution. Positive mesons yield the proton distribution, negative mesons the neutron distribution. (auth)

2561

THE PRODUCTION OF π-MESONS IN PROTON-PROTON COLLISIONS. J. C. Gunn, E. A. Power, and B. Touschek. Phys. Rev. 81, 277-8(1951) Jan. 15. (Letter to the editor)

Calculations are carried out which confirm the interpretation of recent measurements on the production of π mesons in 345-Mev proton-proton collisions showing that the spectrum of the mesons has a strong maximum near the upper energy limit. This has been attributed to the interaction between the resulting proton and neutron and to the possible formation of a deuteron, with a cross section in the laboratory system estimated to be 20×10^{-30} cm^2/sterad-Mev in the forward direction.

NEUTRONS

2562

Los Alamos Scientific Lab.
A DISCUSSION OF THE FISSION NEUTRON SPECTRUM. W. E. Bennett and H. T. Richards. [nd.] (Decl. Feb. 2, 1951) 8p. (AECD-3055; LAMS-1)

References to data obtained from various sources on the energy spectrum of fission neutrons have been made. Results of experimental work are discussed and compared. Graphic data pertinent to the references are included.

2563

Nuclear Development Associates
FINAL REPORT OF THE FAST NEUTRON DATA PROJECT. B. T. Feld, H. Feshbach, M. L. Goldberger, H. Goldstein, and V. F Weisskopf. Jan. 31, 1951. 150p. (NYO-636)

Recent progress in the field of fast neutron reactions is surveyed in the Introduction, and subsequent sections

present theoretical papers on various aspects of nuclear reactions involving, for the most part, fast neutrons (E > 10 kev). The principles and techniques concerned in the analysis of scattering resonances are discussed in Section I, and applied in Section II to fast-neutron scattering data for some 34 nuclei mainly below A = 60. In many instances level assignments and widths have been deduced for the observed resonances. An appendix to this section includes graphs of a number of functions occurring frequently in analysis of resonances. Section III is concerned with the angular distribution of elastically scattered neutrons as predicted by the continuum theory of the nucleus. Especial attention is given to the shape of the "shadow scattering" peak. Inelastic neutron scattering and the (n, 2n) reaction are treated at length in Section IV. General formulae are derived for the total cross section and the angular distribution of the inelastically scattered neutrons when the transitions are from a continuum to only a few levels in the residual nucleus; the case of In^{115} is examined in detail. Tables are included which facilitate the calculation of the angular distributions. When statistical assumptions can be applied to the levels of both the compound and residual nucleus, it is shown that the angular distribution is isotopic. Energy distributions and cross sections for inelastic scattering are derived on the basis of this statistical model. These results are then used to obtain theoretical prediction for the yield curve and neutron energy distributions in the (n,2n) reaction. The experimental information available in the published literature on the inelastic scattering of neutrons is summarized briefly in Section V. Methods for calculating reaction yields and energy distributions of the products are presented in Section VI, based on the statistical model of the nucleus. Section VII then discusses the various threshold reactions used in the measurement of fast neutron fluxes, including a summary of much of the experimental information on such reactions. The energy distribution of the gamma ray, initially emitted upon neutron capture is calculated in Section VIII assuming the statistical model for both the compound and residual nuclei. Section IX deals in a similar fashion with the distribution of gamma rays emitted subsequent to the initial one. The results are compared with experiments. Several of the Sections (I, VI, VIII) are reprinted substantially without change from NYO-632, the Interim Report of the Project. (NSA 5-1091). (auth)

NUCLEAR PHYSICS

2564

Atomic Energy Commission, United Nations
AN INTERNATIONAL BIBLIOGRAPHY ON ATOMIC ENERGY; VOLUME II. SCIENTIFIC ASPECTS. Feb. 14, 1949. 316p. (AEC/INF/10-B)

The entries are arranged alphabetically by author under each of the following section titles: interaction of neutrons with matter (neutron sources, scattering of neutrons by nuclei, absorption of neutrons by nuclei); fission of the atomic nucleus; passage of charged particles through matter; cosmic rays; theory of nuclear structure; physics and engineering of nuclear reactors (fissionable and moderator materials, nuclear reactors and power, atomic energy establishments, health protection); applications of radioactive tracers in nonbiological sciences and technology (mechanism and rates of chemical reactions, chemical effects of nuclear transformations, analytical chemistry, synthesis of labeled compounds, general chemical and physical properties, engineering studies, reviews, and general articles). In all, 4966 entries are given in this volume. An appendix lists the abbreviations of the journals to which reference has been made.

NUCLEAR PROPERTIES

2565

Wisconsin Univ.
TOTAL CROSS SECTION OF HELIUM FOR FAST NEUTRONS. S. Bashkin, F. P. Mooring, and B. Petree. [nd.] 11p. (AECU-1129)

The total neutron cross section of He has been determined at energies from 40 kev to 4.9 Mev by comparing the transmission of neutrons through a He-filled cylinder to the transmission through an identical empty cylinder. The observed cross section increases smoothly from 0.8 barns at 40 kev to 6.7 barns at 1.15 Mev, and then decreases smoothly to 2.3 barns at 4.9 Mev. No splitting of the peak at 1.15 Mev was observed. (auth)

2566

Brookhaven National Lab.
GUIDE TO RUSSIAN SCIENTIFIC PERIODICAL LITERATURE; VOL. 3, NO. 11. John Turkevich and Ludmila Turkevich. Nov. 1950. 33p. (BNL-85)

Reports from Doklady Akad. Nauk S.S.S.R. 72, No. 3-4; Mikrobiologiya 18, No. 6, 19 No. 1-4; Biokhimiya 15, No. 1-4; and Priroda 38, No. 1-6, have been listed under appropriate technical subject headings. Included is an English translation of the article, A Statistical Model of Nuclear Shells, by D. Ivanenko and V. Rodichev (Doklady Akad. Nauk S.S.S.R. 70, 605-8(1950), an abstract of which has appeared in Nuclear Science Abstracts as NSA 4-3188.

2567

Columbia Univ.
NUCLEAR ENERGY LEVEL ARGUMENT FOR A SPHEROIDAL NUCLEAR MODEL. James Rainwater. Apr. 17, 1950. 3p. (CUD-51)

The report is a reprint from Phys. Rev. 79, 432-4(1950), which was abstracted in Nuclear Science Abstracts as NSA 4-5748.

2568

THE ELECTRIC QUADRUPOLE MOMENT AND THE MAGNETIC MOMENT OF THE BROMINE NUCLEUS. J. D. Ranade. Phil. Mag. (7) 42, 279-83(1951) Mar.

Deviations from the interval rule have been observed in the hyperfine structure of the bromine arc spectrum. These are attributable to an electric quadrupole moment of the bromine nucleus. Coupling constants are determined for the term involved. The nuclear quadrupole moment is calculated to be 0.28×10^{-24} cm^2 and the magnetic moment to to be 1.8 nuclear magnetons. (auth)

2569

HYPERFINE STRUCTURE IN THE SPECTRUM OF BROMINE II. J. D. Ranade. Phil. Mag. (7) 42, 284-90 (1951) Mar.

Measurements of the hyperfine structures of 18 classified and 21 unclassified lines of the first spark spectrum of bromine are reported. The spectrum was excited by a high-frequency electrodeless discharge in pure bromine vapor. The patterns are analyzed, and interval factors for 14 terms are given. (auth)

2570

THE MASS OF S^{32}. Henry E. Duckworth, George S. Stanford, John M. Olson, and Cort L. Kegley. Phys. Rev. 81, 286(1951) Jan. 15. (Letter to the editor)

By photographing the $(O^{16})_2 - S^{32}$ doublet ($\Delta f = 5.51 \pm 0.03$), the mass of S^{32} was found to be 31.98237 ± 0.00009. A comparison is made of this value with that of previous measurements.

2571

MICROWAVE STUDY OF Ge, Si, AND S MASSES. S. Geschwind and R. Gunther-Mohr. Phys. Rev. 81, 882-3 (1951) Mar. 1. (Letter to the editor)

The relative masses of the stable Ge isotopes of even mass number and the mass-difference ratios $(S^{33}-S^{32})/(S^{34}-S^{32})$ and $(Si^{30}-Si^{29})/(Si^{30}-Si^{28})$ have been determined from the isotopic shift in the pure rotational absorption spectrum of GeH_3Cl^{35}, $O^{16}C^{12}S$, and SiH_3Cl^{35}, respectively. (auth)

2572

(n,2n) AND (n,p) CROSS SECTIONS. Bernard L. Cohen. Phys. Rev. 81, 184-88(1951) Jan. 15.

Cross sections of several (n,2n) and (n,p) reactions were measured by bombarding samples with a known flux of neutrons and measuring the induced β activity, making elaborate corrections for self-absorption of the β rays. Using the known energy spectrum of the incident neutrons, calculations were made of the cross sections to be expected from Weisskopf's statistical theory, and the agreement was satisfactory. The results indicate that level densities in odd-odd nuclei are greater than those in even-even nuclei by a factor of 3 ± 1. Applications of the method to shielding and the use of threshold detectors are discussed. (auth)

2573

ON THE NONEXISTENCE OF ISOMERISM IN Br^{82}. André Berthelot, Lily Papineau, and Christiane Herczeg. Compt. rend. 232, 498-9(1951) Feb. 5. (In French)

Bromoform, $CHBr_3$, was irradiated in the Chatillon pile for two days. The radiobromine formed by Szilard-Chalmers reaction was extracted with water and used to synthesize C_2H_5Br. Aqueous extractions of samples of this substance were examined for activity produced by isomeric transition and Szilard-Chalmers reaction. Only the 18-min activity of Br^{80} was found except for some 4.5- and 35-hr activity due to entrainment of C_2H_5Br. The sensitivity of the method indicates that not more than 1.5% of the Br^{82} activity could have been produced by an isomeric transition of 18-min or longer half-life. The possibility of a short-lived isomeric state is not excluded.

2574

ON THE NUCLEAR MAGNETIC MOMENT OF Na^{23}. R. A. Logan and P. Kusch. Phys. Rev. 81, 280(1950) Jan. 15. (Letter to the editor)

A precision measurement of the g value of Na is reported. Essentially the determination makes use of the fact that certain lines consist of doublets of a given frequency separation. It was found that, for sodium ($^2S_{1/2}$ state), $g_I(Na)/g_I(H) = 0.26451 \pm 0.008\%$.

2575

POLARIZATION OF THE NUCLEUS BY ELECTRIC FIELDS. G. R. Gunther-Mohr, S. Geschwind, and C. H. Townes. Phys. Rev. 81, 289-90(1951) Jan. 15. (Letter to the editor)

An explanation is given for the difference in the ratio of quadrupole moments of Cl^{35} and Cl^{37} in CH_3Cl from that found in GeH_3Cl (see preceding abstract). This variation is attributed to a fictitious quadrupole moment due to anisotropic polarization of the Cl nuclei by molecular electric fields.

2576

QUADRUPOLE MOMENTS AND THE NUCLEAR SHELL MODEL. B. Touschek. Phil. Mag. (7) 42, 312-14(1951) Mar. (Correspondence)

It has been pointed out by Hill (Phys. Rev. 76, 998(1949)) that the quadrupole moments of atomic nuclei are in reasonable qualitative agreement with the nuclear shell model recently suggested by Haxel et al. (Phys. Rev. 75, 1766(1949); Z. Physik 128, 294(1950)) and Mayer (Phys. Rev. 75, 1969(1949); ibid. 78, 16, 22 (1950)). It is shown that this model makes quite definite predictions about the quadrupole moments of a certain category of odd nuclei and that on the whole these predictions are in good agreement with experiment.

2577

RATIO OF THE QUADRUPOLE MOMENTS OF Cl^{35} AND Cl^{37}. S. Geschwind, R. Gunther-Mohr, and C. H. Townes. Phys. Rev. 81, 288-9(1951) Jan. 15. (Letter to the editor)

Comparison is made of various results previously obtained for the ratio of the quadrupole moments of Cl^{35} and Cl^{37}. The value of the ratio $eqQ(Cl^{35})/eqQ(Cl^{37})$ is redetermined from the microwave spectrum of CH_3Cl, ClCN, and GeH_3Cl using a balanced microwave bridge spectrometer. The corrected value for the ratio in GeH_3Cl is found to be 1.2670 ± 0.0005, with slight differences in other molecules.

NUCLEAR REACTORS

2578

Los Alamos Scientific Lab.
DEPENDENCE OF REACTIVITY OF THE WATER BOILER

ON THE MASS OF 25 IN THE SPHERE. J. Hinton. Dec. 27, 1945. Decl. Jan. 26, 1951. 8p. (AECD-2956; LADC-818)

A semitheoretical determination of the percentage change in reactivity of the water boiler per gram of U^{235} removed from the sphere is presented. The method consists in calculating the external neutron source required to keep level the neutron intensity in the boiler when x g of U^{235} are removed from the sphere. Use is made of the experimentally determined neutron-distribution curves. It is found that 18.2 g of U^{235} subtracted from the sphere produce 1% change in k, the number of fissions produced per generation by each fission in the boiler. (auth)

2579

Los Alamos Scientific Lab.
DISTRIBUTION AND POWER MEASUREMENTS IN THE WATER BOILER. L. D. P. King and R. E. Schreiber. Oct. 10, 1944. Decl. Jan. 25, 1951. 19p. (AECD-3054; LADC-820; LA-152)

The results of a number of experiments with the water boiler have been grouped in this report. Part I describes the neutron-distribution measurements made with U^{235} and U^{238} fission detectors and with Mu foils. Part II compares the foil distribution measurements with the theoretical predictions. The radius of an equivalent untamped sphere is determined and the neutron age for the boiler is calculated. Part III deals with detector-efficiency measurements and determinations of the power from the boiler. 5 figures. (auth)

2580

THE REACTOR AS A RESEARCH TOOL. D. J. Hughes. Paper presented at the 1951 Institute of Radio Engineers National Convention, New York, Mar. 19-22.

An abstract of this paper appeared in Proc. I.R.E. 39, 312 (1951) Mar. and is reproduced here in its entirety.

The chain-reacting pile is extremely useful as a research tool because it produces high intensities of neutrons of a wide range of energies. The neutron flux (number of neutrons/cm^2/sec) available in research reactors is as high as 10^{13}. Many methods are used to select neutrons of particular velocities for specific measurements, such as mechanical shutters, crystal diffraction, and mirrors. The highest-energy neutrons (about 10^6ev) are those emitted in the U fission, and lower energies are produced by collisions of the fission neutrons with moderator nuclei (graphite or heavy water).

NUCLEAR TRANSFORMATIONS

2581

Los Alamos Scientific Lab.
REPORT ON THE ANGULAR DISTRIBUTION OF THE PRODUCTS OF THE $T(d,n)He^4$ REACTION. J. E. Brolley, Jr., J. L. Fowler, and E. J. Stovall, Jr. [nd.] 17p. (AECU-1123; LADC-904)

The differential cross section of the reaction $T(d,n)He^4$ for 10.5-Mev deuterons has been measured from 180 to 33 deg center-of-mass angle of the α particle. Both neutrons and α particles were counted. The angular distribution is similar to that of the mirror reaction, $He^3(d,p)He^4$. (auth)

2582

Radiation Lab., Univ. of California
RELATIVE PHOTO-NEUTRON YIELDS FROM THE 330-MEV BREMSSTRAHLUNG. (abstract) W. N. Jarmie, L. W. Jones, and K. M. Terwilliger. Nov. 3, 1950. 1p. (UCRL-989)

The report is reproduced here in its entirety.

Relative photoneutron yields were determined for 50 elements bombarded bythe 330-Mev x-ray bremsstrahlung of the Berkeley synchrotron. The determinations were made at 90 deg to the beam axis with a BF_3 proportional counter surrounded by a paraffin moderator. Paraffin-cadmium shielding reduced the neutron background to less than 30% of the target yield for all but five targets, and to 4% for the heaviest elements. Statistical counting errors were kept below 3%. Absolute yields per unit beam energy were determined using calibrated Ra-Be and Po-Be sources and the beam energy measurements of Blocker and Kenney. Relative yields for high-Z elements lie on a smooth curve and and are in approximate agreement with Kerst. Deviations from a smooth curve for yields from low-Z elements will be discussed. Angular distributions of photoneutrons were briefly investigated, and a Pb transition curve for photoneutrons was run.

2583

Radiation Lab., Univ. of California
FISSION OF MEDIUM WEIGHT ELEMENTS. Roger E. Batzel and Glenn T. Seaborg. Dec. 18, 1950. 32p. (UCRL-1053)

Evidence is presented which indicates that large fragments (much larger than α particles) are emitted among the competitive products of transmutation throughout the entire range of atomic numbers of the elements. Threshold considerations for the observed nuclear reactions show that the reactions are observed with small cross sections well below the threshold for spallation reactions in which the maximum number of α particles are considered as being emitted from the excited nucleus. The calculated thresholds include the mass difference between the reactants and the products and the excitation energy which the product particles or fragments must have in order to pass over the coulombic barrier. Preliminary experiments on the ranges of recoil fragments from Cu irradiated with 340-Mev protons give additional evidence for the emission of heavy fragments. It is suggested that the term "fission" is proper for such reactions throughout the entire range of atomic numbers in which the nucleus is split essentially into pieces of comparable weight. (auth)

2584

Radiation Lab., Univ. of California
THE HIGH ENERGY SPALLATION PRODUCTS OF COPPER. Roger E. Batzel, Daniel R. Miller, and Glenn T. Seaborg. Jan. 9, 1951. 39p. (UCRL-1077)

Nuclear reactions induced in elemental Cu by irradiation with charged particles accelerated to energies in the hundred-Mev range have been studied, and the reaction

products cover a range from the region of the target nucleus to a region which is removed from the target nucleus by as many as 50 or more nucleons. The yields of the various products were measured, and the results show that a large majority of the products result from reactions in which only a fraction of the total energy of the incident particle is left with the nucleus. The distribution of the amounts of the reaction products is in agreement with a picture of high-energy nuclear reactions involving nuclear transparency and the idea that the nuclear reactions involve excitation following collisions and energy transfers between the individual nucleons in the impinging particle and the individual nucleons in the target nucleus. The results include recent work on the nuclear reactions induced by 340-Mev protons and some earlier qualitative work on the nuclear reactions induced by 190-Mev deuterons and 190- and 380-Mev helium ions. (auth)

2585

EXCITED STATE OF Be^9 FROM THE $B^{11}(d,\alpha)Be^9$ REACTION. D. M. Van Patter, A. Sperduto, K. Huang, E. N. Strait, and W. W. Buechner. Phys. Rev. 81, 233-38(1951) Jan. 15.

The α particles from B bombarded by 1.51-Mev deuterons have been investigated with a magnetic spectrometer. Two groups of α particles have been assigned to the reaction $B^{11}(d,\alpha)Be^9$ with Q values of 8.018 ± 0.007 and 5.596 ± 0.006 Mev, indicating a virtual state of Be^9 at 2.422 ± 0.005 Mev. The previously unreported α-particle group corresponding to this excited state had a natural half-width of less than 7 kev. No additional α groups corresponding to excited states of Be^9 were observed for excitations of Be^9 from 0 to 5.0 Mev. (auth)

2586

FISSION IN Am^{242}. G. C. Hanna, B. G. Harvey, N. Moss, and P. R. Tunnicliffe. Phys. Rev. 81, 893-4(1951) Mar. 1. (Letter to the editor)

Slow-neutron irradiation of Am^{241} produces a nuclide with a large slow-neutron fission cross section. Chemical separation shows this fission to be in the Am fraction, and the growth of fission rate with pile irradiation shows that Am^{242}, the long-lived ground state, is responsible. The fission cross section of the latter is reported as 2500 barns and the capture cross section as 5500 barns.

2587

THE PRODUCTION OF NEUTRONS BY HIGH ENERGY PROTONS. J. M. Cassels, T. C. Randle, T. G. Pickavance, and A. E. Taylor. Phil. Mag. (7) 42, 215-19(1951) Feb. (Correspondence)

The production of neutrons by high-energy protons has been investigated with the help of a differential detector. The third counter in a triple-coincidence telescope used previously for total-cross-section work was replaced by a gridded ionization chamber sensitive only to comparatively slow protons. It followed that protons ejected from the polythene radiator were counted only if they possessed energies lying between certain limits set by a carbon absorber placed immediately in front of the chamber. The counts resulting from n,p collisions in the hydrogen content of the polythene were separated out by background runs with a carbon radiator. After correcting for protons lost while slowing down in the absorber, absolute neutron fluxes in the range 50 to 200 Mev could be found with the help of the Berkeley experiments on the n,p interaction. Neutron spectra obtained from Be, C, Al, and U by bombardment with 171-Mev protons have been plotted.

PARTICLE ACCELERATORS

2588

Brookhaven National Lab.
ACCELERATOR PROJECT; p.33-40 of QUARTERLY PROGRESS REPORT; JULY 1–SEPTEMBER 30, 1950. Nov. 1950. 8p. (BNL-82(p.33-40))

The winding of the magnet coils of the cosmotron, now nearly finished, and the completion of the van de Graaff injector, which is now being installed, are reported. Status of the building, power, van de Graaff electrostatic generator for proton injection, radio-frequency system, pole-face windings and vacuum system is discussed. A brief report of operations involving the 60-in. cyclotron and an electrostatic accelerator is made.

2589

Carnegie Inst. of Tech.
DESIGN AND CONSTRUCTION OF SYNCHRO-CYCLOTRON; FINAL REPORT ON JOINT ONR-AEC PROJECT; FEBRUARY 1, 1947, to SEPTEMBER 1, 1950. E. Creutz. Sept. 1, 1950. 79p. (NYO-780)

The construction of the Carnegie Institute of Technology cyclotron is not yet completed. However, this report is a final summary of the work under the joint Office of Naval Research, Atomic Energy Commission program during the period February 1, 1947, to September 1, 1950. The magnet and coil design, engineering design, vacuum system, oscillator, rotary condenser, shielding, cooling system, research equipment, and site at Saxonburg, Pennsylvania, are discussed and illustrated. The design characteristics of this 420-Mev proton synchrocyclotron are summarized. 18 figures.

2590

Radiation Lab., Univ. of California
ALPHA-DEUTERON DISCRIMINATION BY PULSED ARC POSITION IN AN FM CYCLOTRON. R. D. Watt. Oct. 20, 1950. 9p. (UCRL-748)

During experiments to determine optimum conditions for meson production by α bombardment, it was found that the relative numbers of alphas and deuterons being accelerated were actually unknown and all methods of tuning for their discrimination very unreliable. In order to find the best way to tune the FM cyclotron for alpha-deuteron discrimination the following steps were tried: (1) An accurate frequency monitor on the arc pulse position versus oscillator frequency was set up. (2) Range pictures were taken of the alphas and deuterons with Ilford B-1 research plates. (3) A discriminating current probe was constructed of copper in such a manner that one section of a double probe shaded the other section of the probe from the beam. It is quite

possible to discriminate between alphas and deuterons by accurate timing of the arc pulse position with respect to the r-f frequency. A 20-to-1 ratio can be obtained after several days of α operation, and with careful tuning on the double probe.

2591

DESIGN OF ACCELERATION CHAMBER AND DEES FOR THE 225-CM CYCLOTRON AT THE NOBEL INSTITUTE FOR PHYSICS, STOCKHOLM. Hugo Atterling. Arkiv Fysik 2, No. 6, 559-70(1951) Jan. 15.

Design details of the acceleration chamber and dees for the new cyclotron are presented. This cyclotron has a pole diameter of 225 cm and is of the conventional type (i.e., operating without frequency modulation). The chamber and the dees have been designed for accelerating ions to a maximum radius of 90 cm. 11 figures.

2592

Carnegie Inst. of Tech.
DISCRIMINATOR DESIGN AND CONSTRUCTION FOR THE CARNEGIE INSTITUTE OF TECHNOLOGY SYNCHRO-CYCLOTRON; SYNCHRO-CYCLOTRON TECHNICAL REPORT NO. 7. Charles H. Grace. Oct. 8, 1950. 28p. (NP-1945)

The discriminator described in this report determines the time of operation of the ion-beam deflector of the Carnegie Institute of Technology 420-Mev synchrocyclotron. Both simplified and detailed descriptions of operation and calibration of the discriminator are given, with specifications, operating instructions, and circuit diagrams.

2593

A 200-kv NEUTRON GENERATOR, I. Gösta Carlson. Arkiv Fysik 2, No. 4, 277-87(1950)

A neutron generator has been constructed at the Institute of Physics, Upsala, Sweden which is designed for the D(d,n) reaction $D^2 + D^2 = He^3 + n^1$. The ion source is of the low-voltage arc type, and is supplied with deuterium gas from a gas reservoir; the target consists of heavy-water ice, strongly cooled with liquid air. Experiments have also been made with another target which requires less strong cooling, viz., heavy water and P_2O_5. A disadvantage is the inferior neutron output then obtained. The acceleration tube, which is supplied with a separating magnet, yields a good monokinetic ion beam. Two different kinds of ion sources of a low-voltage arc type have been used. One of the ion sources is constructed with a straight capillary of a length of 20 mm and a diameter of 3 mm. Gas is supplied through an accurate adjustable needle valve, which opens out into the middle of the capillary. The other ion source the anode is fixed insulated to a disk of Perspex, and is cooled by oil. The filament, a 0.25-mm tungsten wire, is supported by four sparking plugs and is located around the conical steel diaphragm. Descriptions of the acceleration tube, evacuation facilities, and a coupling scheme for high-voltage installation are included.

2594

A 200-kv NEUTRON GENERATOR, II. I. Bartholdson and G. Carlson. Arkiv Fysik 2, No. 4, 289-93(1950).

In a previous paper (Carlson, Arkiv Fysik 2, No. 4, 277-87 (1950); see preceding abstract) the construction of the neutron generator at the Institute of Physics, Upsala was described. This paper concerns the adjustment of the generator and some preliminary measurements. The neutron yield of the D(d,n) reaction was determined as a function of the deuteron energy. Measurements of the neutron yield were carried out by using a heavy-ice target cooled with liquid air. The heavy water used had a purity of 99.6%. The neutrons were recorded by a screened BF_3 counter surrounded with a paraffin moderator. The measurements were made both with atomic (D^+) and molecular (D_2^+) ions. After the measurements were corrected with regard to the background and the neutrons were released in the ion separation system, the relative strength was determined in relation to two Ra-Be sources of 100 and 20 mc.

2595

SOME FEATURES OF A LINEAR ACCELERATOR. Pierre Grivet and Jean Vastel. Compt. rend. 232, 809-10(1951) Feb. 26. (In French)

The first section of a linear accelerator intended to furnish 4- to 5-Mev electrons has been constructed and tested. This progressive-wave-type apparatus is supplied with 2-μsec impulses at 80 kv from a magnetron, and gives an instantaneous yield of several ma of 0.4-Mev electrons. The measured characteristics agree remarkably with the theoretical formulas.

2596

STUDY ON THE ION SOURCE. Bunsaku Arakatsu, Yoshiaki Uemura, Shinjirô Yasumi, Masakatsu Sakisaka, and Syôichi Miyashiro. Bull. Inst. Chem. Research Kyoto Univ. 23, 57 (1950) Dec. (abstract)

Brief note is made of an ion source using the discharge in a magnetic field to produce ion current. The discharge is produced in a cylindrical space 1 cm in diameter and 3 cm in length. The ion source operated at the discharge voltage of 1000 to 2000 volts direct current and at a pressure of 8×10^{-4} to 3×10^{-3} mm Hg produced an ion current of 20 to 300 μa.

2597

TRIAL MANUFACTURE OF ELECTRON ACCELERATOR. Kiichi Kimura, Isao Kumabe, Tetsuro Nakatau, Hidero Ueyanagi, and Asao Kusumegi. Bull. Inst. Chem. Research Kyoto Univ. 23, 56(1950) Dec. (abstract)

An electron accelerator using a single cavity resonator is described briefly. The resonator is excited by loop coupling through a cylindrical wave guide and a coaxial cable. The accelerator, tested with an electron field in the axial direction of the cavity, producted electrons of 18-kv energy.

RADIATION ABSORPTION AND SCATTERING

2598

Knolls Atomic Power Lab.
ATOMIC DISPLACEMENTS PRODUCED BY FISSION FRAGMENTS AND FISSION NEUTRONS IN MATTER. J. Ozeroff. June 29, 1949. Decl. Feb. 1, 1950. 41p. (AECD-2973; KAPL-205)

About four-fifths of the energy of the fission process is shared by the two heavy fragments into which the nucleus splits. This energy, of about 80 Mev per fragment, is transferred to the medium in which the fission takes place in two ways. First, because each fragment is stripped of about half its electrons during most of its path, it will interact strongly with electrons and thus lose energy through ionizing collisions with other atoms. Secondly, the fragments will lose energy by elastic collisions with atoms as a whole. Each fragment leaves in its wake a cloud of moving electrons and atoms. This cloud will roughly resemble a cylinder whose radius will increase with time on account of the motion of the struck electrons and atoms. Two features of the slowing down process are investigated; first, its effect on the fragment, i.e., its range, straggling, etc., is calculated; and secondly, the motion of the cylinder of moving particles, its effect on the medium, etc., have been worked out.

2599

Brookhaven National Lab.
COHERENT NEUTRON-PROTON SCATTERING BY LIQUID MIRROR REFLECTION. (abstract) G. R. Ringo, M. T. Burgy, and D. J. Hughes. Dec. 7, 1950. 1p. (AECU-1048)

The report is reproduced here in its entirety.

A measurement of the coherent neutron-proton scattering amplitude, utilizing total reflection of slow neutrons from a liquid hydrocarbon, has been reported (Hughes et al., Phys. Rev. 77, 291(1950)). As the result $(-3.75 \pm 0.03) \times 10^{-13}$ cm was significantly different from existing values, the measurement was repeated with a series of liquids and at several neutron wave lengths in order to investigate systematic errors. The repetitions (Hughes et al., Phys. Rev. 79, 227 (1950)) showed no disagreement with the original value and indicated that the accuracy of the method could be increased. Final measurements have now been made utilizing a series of carefully purified hydrocarbon liquids and a method in which no measurement of neutron wave length is necessary. The ratio of the amplitude of hydrogen to that of carbon has been determined to 0.3%, and the final value of the hydrogen amplitude, including the error (0.5%) in the carbon amplitude (Havens and Rainwater, Phys. Rev. 75, 1296 (1950)), is $(-3.78 \pm 0.02) \times 10^{-13}$ cm (standard error). This value is the weighted average of the results obtained with purified liquids.

2600

Argonne National Lab.
PROGRESS REPORT; RADIOLOGICAL PHYSICS RESEARCH; p.135-41 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH QUARTERLY REPORT, MAY, JUNE, JULY, 1950. S. S. Brar, R. K. Clark, and L. D. Marinelli. July 1950. 7p. (ANL-4488(p.135-41))

Work on β-ray dosimetry concerned with the problem of the distribution in air of the ionization due to a point source of β particles is reported. The experimental work is being done in a room large enough to exclude β radiation (P^{32}) scattered by walls, floor, and ceiling from reaching the ionization chambers. The relative positions of the source and ion chamber are determined with the aid of a surveyor's transit. Results obtained with two Al-covered chambers are summarized. Drawings illustrating the plan of the room used, the β-ray source, and the β-ray ionization chamber are included with a photograph of the room and a graphic presentation of the β-ray absorption.

2601

Radiation Lab., Univ. of California
PROTON-PROTON SCATTERING IN THE ENERGY RANGE 120 TO 345 MEV. (abstract) O. Chamberlain, E. Segrè, and C. Wiegand. Dec. 11, 1950. 1p. (UCRL-1036)

The report is reproduced here in its entirety.

Previously reported (Chamberlain and Wiegand, Phys. Rev. 79, 81 (1950)) measurements on the differential scattering cross section in proton-proton collisions have been refined with the use of stilbene scintillation counters and coincidence circuits with short (2×10^{-8} sec) resolving time. Some measurements have been made at energies lower than 345 Mev by placing Li absorbers in the proton beam of the 184-in. Berkeley cyclotron. The most remarkable feature of the results is that in all cases the differential scattering cross section in the center-of-mass system is between 3.6×10^{-27} and 4×10^{-27} cm^2/sterad. The energies studied and the range of angles included are as follows: 345 Mev (36 to 90 deg); 249 Mev (48 to 90 deg); 164 Mev (60 to 90 deg); 119 Mev (63 to 90 deg). In all cases the energies are those of the laboratory coordinate system, while the angles (and differential cross section) are those of the center-of-mass system.

2602

A COMPARISON OF TWO METHODS FOR CORRECTING FOR SELF-ABSORPTION OF BETA PARTICLES, USING SULFUR^{35}. George K. Schweitzer and Jack T. Garrett. J. Phys. & Colloid Chem. 55, 195-9(1951) Feb.

The results obtained by plotting observed β activity against sample thickness are compared to the purely graphical method of handling self-absorption in which the logarithm of activity/mg/cm^2 is plotted against thickness in mg/cm^2. It was found that the two methods agree within experimental error.

2603

MULTIPLE SCATTERING OF FAST PARTICLES IN PHOTOGRAPHIC EMULSIONS. L. Voyvodic and E. Pickup. Phys. Rev. 81, 890(1951) Mar. 1. (Letter to the editor)

It is pointed out that the detailed multiple-scattering theory of Williams (Proc. Roy. Soc. (London) 169 A, 531(1939);

Phys. Rev. 58, 292(1940)) gives results in approximate agreement with recent experiments (Voyvodic and Pickup, Phys. Rev. 81, 471(1951); Corson, Phys. Rev. 80, 303(1950)) in measuring the small-angle scattering of fast particles in photographic emulsions.

2604

ON THE SPACE ENERGY DISTRIBUTION OF SLOWED-DOWN NEUTRONS. Gunnar Holte. Arkiv Fysik 2, No. 6, 523-49(1951).

The stationary space-energy distribution of neutrons in an infinite, homogeneous slowing-down medium, containing nuclei of mass M has been studied. The neutrons are supposed to be emitted isotropically with constant energy E_0 from a point source. The mean free path λ is assumed to be constant for energies below E_0. For neutrons of energy E at the distance R from the source (putting $\lambda = 1$) the number of collisions per unit volume per unit energy range is $F_0(R,E) = (Q/Ex^{3/2})\mu e^{-\nu R}$, where Q is the number of neutrons emitted per unit time and $x = \log E_0/E$. ν and, to the first approximation, also μ are functions of R/x only. When R/x varies from 0 to ∞, ν increases monotonically from 0 to 1, at first, for very small R/x, proportionally to R/x, for intermediate values of R/x more slowly. In particular, for $R/x \gtrsim M/2$ roughly corresponding to $\nu \gtrsim 0.4$, in dividing these values of R/x up to ∞ into some few intervals, $\nu = a - 2\sqrt{(bx/R)} + (cx/R)$ where a, b, and c are constant within each of these intervals. μ is approximately constant for very small R/x, and then decreases with increasing R/x, for intermediate values of R/x, roughly as x/R, and, for very large R/x, as $(x/R)^{1/4}$. The formula is valid at any distance R for neutrons considerably slowed down ($x \gg 1$), but, for increasing R, also for higher neutron energies ($Rx \gg 1$). The assumption of constant λ is a good approximation in general only for $E_0 \lesssim 0.1$ Mev (roughly) but by choosing a suitable mean value for λ the formula may be applied even for higher E_0, at least qualitatively. Applications have been made to deuterium and carbon. (auth)

2605

California Univ., Los Angeles
A SURVEY EXPERIMENT IN ELASTIC SCATTERING; TECHNICAL REPORT NO. 6. Jack W. Burkig and Byron T. Wright. Nov. 1950. 28p. (NP-1966)

Using 18.6-Mev protons, the differential elastic-scattering cross section at 78.7 deg of 11 elements was measured relative to W. The values for Al, Fe, Ni, Cu, Pd, Ag, Sn, Ta, W, Pt, Au, and Pb were 0.53, 0.15, 0.17, 0.30, 0.53, 0.49, 0.38, 1.0, 0.92, 1.2, 1.3, and 1.5, respectively. With the exception of Al, these results lie surprisingly near the Z^2 dependence expected for Rutherford scattering. In addition, angular distributions of elastic scattering were determined for 4 elements, W, Pd, Ni, and Al, with points at intervals of approximately 15 deg between 26 and 106 deg. For W the distribution decreases monotonically, and a plot of $\log \sigma$ versus $\log \chi$, where χ is the scattering angle, approximates a straight line of slope $b = -4.7$ compared to a slope $b = -3.5$ for Rutherford scattering, where $\log \sigma = a + b \log \chi$. Pd has local variations as large as ±50% about the Rutherford law. For $\chi > 50$ deg the Al and Ni distributions decrease slower than a Rutherford dependence and have local variations as large as ±50% about their average angular dependence.

2606

THEORY OF GENERALIZED DOUBLE COMPTON SCATTERING. Gérard Petiau. Compt. rend. 232, 701-3(1951) Feb. 19. (In French)

A general expression is derived for the cross section corresponding to the process of generalized double Compton scattering, in which a particle of spin $\hbar/2$ absorbs a quantum of a field C_0 of spin 0 or $\hbar$ and emits two quanta belonging, respectively, to fields C_1 and C_2 of spin 0 or $\hbar$. A complete expression is given for the case where the fields C_0, C_1, and C_2 are pseudoscalar.

2607

TOTAL CROSS-SECTIONS OF HYDROGEN AND CARBON FOR HIGH ENERGY NEUTRONS. A. E. Taylor, T. G. Pickavance, J. M. Cassels, and T. C. Randle. Phil. Mag. (7) 42, 20-8(1951) Jan.

Measurements of the attenuation of a beam of high-energy neutrons in carbon and polythene have been made in good geometry. The total cross sections of hydrogen and carbon have been found to be $(0.0464 \pm 0.0012) \times 10^{-24}$ cm^2 and $(0.330 \pm 0.003) \times 10^{-24}$ cm^2, respectively, at an effective neutron energy of 156 ± 3 Mev. (auth)

RADIATION EFFECTS

2608

ELECTRON BOMBARDMENT CONDUCTIVITY OF (BaSr)O. (II). Kiichi Kimura and Kyozo Ohira. Bull. Inst. Chem. Research Kyoto Univ. 23, 53-4(1950) Dec. (abstract)

Brief note is made of the bombardment of (BaSr)O by electrons from a (BaSr)O emitter. The resistance change versus the applied accelerating voltage shows a minimum at 0.2 v and increases up to 0.7 v, above which no increase in resistance of the bombarded sample is noted.

RADIOACTIVITY

2609

Los Alamos Scientific Lab.
RADIOACTIVITY UNITS AND RADIOGRAPHY. Arthur I. Berman. Oct. 24, 1950. 21p. (AECU-1109; LADC-888)

A great amount of confusion exists in the fields employing radioactive isotopes because not one of the many unofficial definitions of the unit of radioactive source strength, the curie, has gained universal approval. Furthermore, this same unit has come to mean something entirely different in various radiographic installations, namely, a measure of γ-ray intensity. This paper reviews several definitions of the curie, with an alternate unit for describing the source strength of those radioisotopes which emit γ rays. A proposal is introduced for comparing the quality of γ radiation from different sources in order to meet the requirements of industrial radiography. (auth)

2610

Brookhaven National Lab.
HALF-LIFE OF I^{129} AND THE AGE OF THE ELEMENTS.

S. Katcoff, O. A. Schaeffer, and J. M. Hastings. [nd.] 9p. (AECU-1149)

The specific activities of several samples of methyl iodide containing I^{129} were measured with proportional counters, and the ratios of I^{129} to I^{127} were determined with a 60-deg sector-type mass spectrometer. The half-life of I^{129} was found to be $(1.72 \pm 0.09) \times 10^7$ yr. The time interval between the formation of the elements and the formation of the earth calculated from this value is 2.7×10^8 yr. It was assumed that most of the Xe^{129} present on the earth at present originated from decay of I^{129} after the formation of the earth and that the original cosmic abundance of I^{129} was about equal to that of the stable I^{127}. (auth)

2611

Princeton Univ., and Brookhaven National Lab.
CONVERSION LINES AND BETA SPECTRA OF Np^{239}. (abstract) E. P. Tomlinson, H. W. Fulbright, and J. J. Howland, Jr. [nd.] 1p. (AECU-1153)

The report is reproduced here in its entirety.

The momentum distribution of electrons emitted by Np^{239} has been studied using a 20-cm-radius high-resolution double-focusing magnetic spectrometer of the Siegbahn-Svartholm type. In this study 88 electron lines were observed with varying degrees of certainty down to an energy of 3 kev. Most of these lines were obtained with a full width at half maximum in $H\rho$ between 0.3 and 0.4%. About ⅔ of the lines are accountable as conversion electrons from 11 γ rays. A Kurie analysis of the underlying β spectra gives clearly at least four β groups and probably other lower energy groups. Preliminary values, in kev, for the γ-ray energies are 286, 277, 254, 228, 209, 105, 67.5, 61.4, 57.0, 49.0, 44.2. Preliminary values for the β-ray end points, in Mev, are 0.715, 0.654, 0.44, and 0.33. The energy-level scheme of Pu^{239} will be discussed on the basis of these data.

2612

Brookhaven National Lab.
RADIATIONS FROM IODINE-126; p.96-100 of QUARTERLY PROGRESS REPORT; JULY 1 – SEPTEMBER 30, 1950. G. Friedlander and M. L. Perlman. Nov. 1950. 5p. (BNL-82(p.96-100))

The decay scheme of I^{126} produced by I^{127} (n,2n) reaction is being investigated by x-ray spectrometer, β-ray spectrometer, scintillation spectrometer, absolute β counting, and coincidence measurements. The ratio of electron capture probability to β decay probability has been found to be 1.35 ± 0.2. Negative β-ray groups with end points at 1.24 and 0.85 Mev and conversion electrons of a 0.382-Mev γ ray have been observed. Coincidence measurements have shown that the high energy β rays go to the ground state of Xe^{126} whereas the low-energy β rays go to the ground state of γ transition. On the electron capture side, a 640-kev γ ray and some γ-γ coincidences have been observed. A small amount of positron decay, tentatively estimated as 2% of all transitions, has also been established. Further work on the decay scheme is in progress. In the light of the results, the yield of the reaction I^{127} (γ,n) I^{126} as determined by β counting and the trend of (γ,n) yields with atomic number are discussed. (auth)

2613

Pupin Physics Labs., Columbia Univ.
THE ANGULAR CORRELATION OF SCATTERED ANNIHILATION RADIATION. C. S. Wu and I. Shaknov. Nov. 21, 1949. 1p. (CUD-42)

The report is a reprint from Phys. Rev. 77, 136(1950), which was abstracted in Nuclear Science Abstracts as NSA 4-2807.

2614

Ames Lab.
RADIATIONS FROM Yb^{169}. Don S. Martin, Jr., Erling N. Jensen, Francis J. Hughes, and R. T. Nichols. Dec. 14, 1950. 39p. (ISC-127)

The radiations from Yb^{169} have been examined by means of a thin-lens spectrometer and absorption-coincidence techniques. The half-life was found to be 33 ± 1.5 days. The half-life of the metastable state was determined as 0.67 μsec. Yb^{169} decays by electron-capture to Tm^{169}. Eleven γ rays were observed in the photoelectron and internal-conversion spectra determined with the spectrometer. On the basis of the absorption-coincidence and spectrometer data two decay schemes are discussed. (auth)

2615

Radiation Lab., Univ. of California
RADIOCHEMICAL AND SPECTROMETER STUDIES OF SEVERAL NEUTRON-DEFICIENT ZIRCONIUM ISOTOPES AND THEIR DECAY PRODUCTS. Earl K. Hyde and Grover D. O'Kelley. Dec. 28, 1950. 38p. (UCRL-1064)

Radioactive Zr isotopes of mass number <90 have been prepared by bombardment of Nb with 100-Mev protons. These isotopes and their decay products have been extensively studied in the β-ray spectrometer and by radiochemical methods. Zr^{87} is shown to be a 94 ± 6-min activity emitting positrons of 2.10 ± 0.02-Mev energy and decaying into Y^{87m}. Accompanying its 14-hr decay into Y^{87}, Y^{87m} has a complex γ-ray spectrum. The most prominent conversion electrons correspond to a 0.389 ± 0.004-Mev γ ray. Y^{87} decays by orbital electron capture into Sr^{87m} which isotope decays by emission of a 0.394 ± 0.004-Mev γ ray with a 2.80 ± 0.03-hr half-life into stable Sr^{87}. Zr^{86} is a 17 ± 2 hr orbital electron-capturing isotope decaying into Y^{86} which in turn disintegrates into stable Sr^{86} with a half-life of 14.6 ± 0.2 hr by the emission of positrons. This positron spectrum is complex, with two components of approximately equal intensity. The energies are 1.80 ± 0.02 and 1.19 ± 0.02 Mev. The latter appears to have a forbidden Fermi-Kurie plot corresponding to first-forbidden transition with a spin change of two units and a change of parity. The energy of the Zr^{89} positron is redetermined as 0.910 ± 0.010 Mev. Conversion electrons corresponding to previously unreported γ rays of energy 0.027, 0.396, 0.917, and 1.27 Mev are observed. Preliminary evidence for Zr^{88} is presented which indicates that this isotope decays by the capture of orbital electrons with a half-life of the order of months into a 105-day Y^{88}. Conversion electrons of 0.406-Mev γ ray are prominent in the decay of Zr^{88}. (auth)

2616

THE BETA-RADIATIONS OF UX_1 AND UX_2. M. Heerschap, Ong Ping Hok, and G. J. Sizoo. Physica 16, 767-80(1950) Oct.

The complete β spectrum of $U(X_1 + X_2)$ was measured with a 180-deg spectrometer. The primary spectrum of UX_1 proved to be decomposable into two components with endpoints at 192 and 104 kev and intensities 56 and 44%. That of UX_2 showed three components with endpoints at 2320, 1500, and 600 kev, the intensities being 80, 13, and 7%. The reality of the 600-kev component, however, is considered as dubious. The secondary spectrum of UX_1 shows three lines which could be explained by conversion of a 90.4-kev nuclear γ ray in the L_1, M_1, and N_1 shell. That of UX_2 consists of two lines, arising by conversion of an 817-kev nuclear γ ray in the K and L_1 shell. As far as concerns the values of the energies the results are in good mutual agreement. Serious discrepancies remain between the intensities of the γ ray derived from the β spectra and those determined by absorption measurements. (auth)

2617

THE CAPTURE OF ORBITAL ELECTRONS BY NUCLEI (K-CAPTURE). C. Sharp Cook. Am. J. Phys. 19, 37-47 (1951) Jan.

A review of recent work on K-capture of orbital electrons by nuclei, including a simple outline of the underlying theory and a discussion of the conditions under which the phenomenon occurs, is presented. A brief description is given of the instruments and methods used to observe K-capture. (auth)

2618

ADDENDUM: THE DISINTEGRATION OF Ti^{45}. M. Ter-Pogossian, C. S. Cook, F. T. Porter, K. H. Morganstern, and J. Hudis. Phys. Rev. 81, 285(1951) Jan. 15. (Letter to the editor)

A note is added to "The Disintegration of Ti^{45}," Phys. Rev. 80, 360(1950), placing in doubt the 780-kev γ line of Ti^{45}, as found by Kubitschek et al. (Phys. Rev. 77, 742(1950)), and attributing the observed Compton electrons to the 890-kev γ ray of Sc^{46}, instead.

2619

ENERGY OF Pu^{239} α PARTICLES. Monique Conjeaud and Victor Naggiar. Compt. rend. 232, 499-500(1951) Feb. 5. (In French)

By comparing the impulses produced in an ionization chamber by sources of Pu and Po and registered by photographing an oscilloscope screen, the energy of the Pu α particle was found to be 5.134 ± 0.015 Mev. (The Po α energy was taken to be 5.298 Mev.)

2620

Oak Ridge National Lab.
THE FORMATION OF ELECTRON PAIRS IN RADIOACTIVE DECAY; trans. from Zhur. Eksptl'. i Teoret Fiz. 7, 696-713, (1937). V. B. Tissa; tr. by C. Feldman. 1937. 29p. (NP-2178)

The probability of pair formation in radioactive β and γ decay is calculated by first-order perturbation methods from the Dirac theory. The field of the nucleus was neglected, the electron was considered as free, and second-order effects were not considered. Formulas are obtained for the limiting cases of low and high β and γ energies.

2621

GAMMA-RAY SPECTRUM OF K^{40}. Myron L. Good. Phys. Rev. 81, 891-2(1951) Mar. 1. (Letter to the editor)

The γ-ray spectrum of K^{40} has been measured using a scintillation spectrometer. The crystal employed for this measurement was a 1-in. cube of NaI(Tl). The crystal housing was surrounded with 25 lb of normal K_2CO_3 as a source of K^{40}. Using the Co^{60} upper γ ray as standard at 1.332 ± 0.001 Mev, the γ-ray energy for K^{40} was determined to be 1.459 ± 0.007 Mev.

2622

THE INTERNAL-CONVERSION β SPECTRUM EMITTED IN THE TRANSMUTATION Io − Ra. Salomon Rosenblum and Manuel Valadares. Compt. rend. 232, 501-3(1951) Feb. 5. (In French)

The β rays emitted by an ionium (Th^{230}) source following the internal conversion of the γ radiation have been studied, and the problem of assignment to given transitions is discussed.

2623

THE INTERNAL CONVERSION RADIATIONS OF Pu^{239}. Georgette Albouy and Jean Teillac. Compt. rend. 232, 326-8(1951) Jan. 22. (In French)

The internal conversion of Pu^{239} has been studied with 200-μ-thick Ilford G5 sensitive emulsions. A total of 5200 α trajectories, of which 824 had a common origin with an electron, were measured. The L and M rays could not be separated on an energy histogram, but K-conversion radiation of about 200 kev with an intensity of less than 1% was observed.

2624

STUDY OF Cd^{109} IN A WILSON CLOUD CHAMBER. Bertrand Dreyfus, John Keene Major, and Pierre Radvanyi. Compt. rend. 232, 617-18(1951) Feb. 12. (In French)

The disintegration by K-capture of Cd^{109} has been studied in a variable-pressure Wilson cloud chamber. The measurements on conversion electrons and γ rays are in accord with previous results, but the cloud-chamber method does not appear to advantage in precise determinations of this nature.

RARE EARTHS AND RARE-EARTH COMPOUNDS

2625 AECU-1130; LADC-950

Los Alamos Scientific Lab.
MAGNETIC SUSCEPTIBILITIES OF PRASEODYMIUM OXIDES. Sherman W. Rabideau. [nd.] 10p. (AECU-1130; LADC-950)

The magnetic susceptibilities of the three oxides of praseodymium, Pr_2O_3, Pr_6O_{11}, and PrO_2 have been measured with the Faraday magnetic balance over a temperature range from 80 to 300°K. These oxides have been found to have moments of 3.55, 2.84, and 2.48 Bohr magnetons, respectively, and to obey the Weiss modification of the Curie law, $\chi(T + \Delta) = C$, over the temperature range studied. Values of Δ for the three oxides were found to be 55.0, 41.2, and 104°. (auth)

SHIELDING

2626 AECU-1135

Brookhaven National Lab.
NOMOGRAM FOR SHIELDING FROM POINT SOURCE OF COBALT^{60}. George A. Bennett. [nd.] 6p. (AECU-1135)

Co^{60} is one of the most widely used sources of high-energy γ rays for experimental work in both the physical and biological sciences. Since rather long calculations are required to determine the shielding thickness under different conditions of exposure, it was felt that a useful tool would be a nomogram, specifically constructed for this isotope and simplified to the point where the technician with no previous knowledge of shielding could use it without having to make any side calculations whatever. The nomogram presented attempts to fulfill these requirements.

THEORETICAL PHYSICS

2627

CALCULATIONS OF PERTURBATIONS IN QUANTUM MECHANICS. Marcel Mayot. Compt. rend. 231, 1426-8 (1950) Dec. 18. (In French)

A procedure for constructing a polynomial characteristic of a Hermitian matrix with many zero elements is given. The calculation is carried out by recurrence, starting with very simple matrices, and the result is expressed in Tchebychef polynomials. These matrices occur in the calculation of perturbations in complex molecular systems.

2628

THE FOURIER TRANSFORM OF THE DIRAC EQUATION. Guy Rideau. Compt. rend. 231, 1286-8(1950) Dec. 6. (In French)

Using the general method of Fourier transformation previously discussed (Compt. rend. 231, 949(1950)) the author derives an equation which identifies the Fourier coefficients of any solution of the Dirac equation, and deduces from it the possibility of writing the Dirac equation in the form of an integral equation.

2629

MASSES AND ENERGIES OF ATOMIC NUCLEI. A. M. Mosharrafa. Proc. Math. Phys. Soc. Egypt 4, 15-22(1949) May.

In a previous paper (Proc. Math. Phys. Soc. Egypt 3, 19 (1945)) a metric of space-time was proposed by the author. A similar metric had been independently proposed. Both forms of metric lead to the world line of a charged particle as a geodesic. The author now points out that the new metric makes the mass of a particle a function of its potential energy. This gives a simple explanation of the packing effect. The potentials and effective radii of atomic nuclei are calculated from available data. The mass of an electron in a nuclear field indicates that β disintegration is more akin to the emission of field energy than to particle ejection. The mass of a positron becomes very small in the neighborhood of nuclei. A purely empirical graph is given of (M − A) plotted against A, where M is the atomic weight and A is the mass number of an element. It appears to exhibit periodic properties. A period of 4 can be seen, also possibly a period of 16 or 18.

2630

A NOTE ON THE CALCULATION OF THE FERMI FUNCTION IN THE THEORY OF BETA-DECAY. J. Y. Mei. Phys. Rev. 81, 287-8(1951) Jan. 15. (Letter to the editor)

A brief note is presented on accurate calculation of the Fermi functions. The accuracy of the different prevailing approximations for the three typical cases of the light nucleus S^{35}, the medium nucleus Cu^{64}, and the heavy nucleus RaE is compared with the exact calculations.

2631

A NOTE ON RAINWATER'S SPHEROIDAL NUCLEAR MODEL. E. Feenberg and K. C. Hammack. Phys. Rev. 81, 285(1951) Jan. 15. (Letter to the editor)

The energy of the spheroidal system contains a linear term from the shift in the eigenvalue of the extra-core particle. A derivation of the linear term is presented.

2632

NUMERICAL EVALUATION OF THE FERMI BETA-DISTRIBUTION FUNCTION. D. G. E. Martin. Phys. Rev. 81, 280-1(1951) Jan. 15. (Letter to the editor)

It is pointed out that, in the Fermi β-distribution function, the modulus of the gamma function of the complex argument can be obtained in terms of the polygamma functions of real arguments. A sample calculation is made.

2633

THE TRANSFORMATION IN MOMENTUM SPACE IN THE THEORY OF COLLISIONS. Guy Rideau. Compt. rend. 231, 949-51(1950) Nov. 6. (In French)

The problem of determining the Fourier transform coefficient of the Schroedinger equation is considered. The determination of the Fourier transformation by an integral equation is particularly adapted to the theory of collisions of plane waves. It is necessary to add another term to the integral equation usually obtained, otherwise only the coefficient corresponding to a particular solution of the Schroedinger equation is given.

TRACER APPLICATIONS

2634

Brookhaven National Lab.
A MECHANICAL WEAR TEST USING FISSION FRAGMENTS. David H. Frisch and Jules S. Levin. Aug. 15, 1950. 8p. (AECU-1078)

A "hot patch" of surface radioactivity is applied locally to a surface by placing an enriched fission foil near the surface and irradiating the fissionable material with neutrons from a source surrounded by a moderator of, e.g., paraffin, water, or oil. The method is adapted to measuring wear depths of from a few millionths to a few ten-thousandths of an inch of dense materials, and up to a mil of lighter materials such as plastics. Wear may be measured at times from minutes to months after irradiation. The total amount of induced radioactivity involved is negligible from a health standpoint. (auth)